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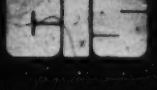

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S. HRG. 100-193

NOAA AUTHORIZATION

HEARING

BEFORE THE

NATIONAL OCEAN POLICY STUDY

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDREDTH CONGRESS

FIRST SESSION

ON

AUTHORIZATIONS FOR THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION'S OCEAN AND COASTAL PROGRAMS

MAY 13, 1987

Printed for the use of the
Committee on Commerce, Science, and Transportation

U.S. GOVERNMENT PRINTING OFFICE

74-930 O WASHINGTON : 1987

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NOAA'S OCEAN AND COASTAL PROGRAMS AUTHORIZATION

WEDNESDAY, MAY 13, 1987

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
NATIONAL OCEAN POLICY STUDY,
Washington, DC.

The committee met at 2:25 p.m. in room SR-253, Russell Senate Office Building, Hon. John Kerry (Vice Chairman of the Study) presiding.

Staff members assigned to this hearing: Mike Nussman, professional staff member, and Bob Eisenbud, minority professional staff member.

OPENING STATEMENT BY SENATOR KERRY

Senator KERRY. The hearing will come to order. My apologies to all for the delay. As I think you all know, it is beyond our control. We had other hearings going on and a considerable series of most important votes that were concerning us today.

I am delighted to be chairing the Commerce, Science, and Transportation National Ocean Policy Study hearing today. As you all know, these are subjects of enormous importance to all of us.

The witnesses today are appearing on the subject of the reauthorization of a number of significant ocean and coastal programs within NOAA's National Ocean Service agency, and also we are here to listen with respect to the Sea Grant College Program Act reauthorization. Over the years, that program is also one that I think has been exemplary in the development of essential ocean resources.

The issues that face both the atmosphere and the oceans today are obviously not simple. This committee has met before on them. We have been here for reauthorizations before.

But I think it is safe to say that the water quality of our estuaries and of our coastal areas are in a state of steady decline. The status of our global climate is more in question today than ever before.

In general, the human threat to our environment, caused by various activities from illegal ocean dumping to offshore drilling to oil spills, the problem of toxic chemicals, and not just into the oceans, but lakes, rivers, and streams, all have to be met with an unprecedented human effort designed to try to battle this problem.

My colleagues on this committee and those preceding me in this chair have all previously exhibited a significant concern regarding

these issues. But we still need to examine the question of whether or not our coordination among the agencies is adequate.

Are our Federal agencies utilized to the best of their ability to be able to do what we have set out for them to do as a task? Is the Federal Government working with or against our States in this effort? And to what degree are our scientists working with scientists from other nations to solve the problems that we face?

And today's hearing affords us an opportunity to try to address issues such as these, so that we can devise some viable options and continue to guarantee that we are moving in the right direction and in fact that we are moving in some direction.

I look forward, therefore, to hearing from our experts. We have three different panels, and before we proceed to an introduction of the first panel let me turn to my colleagues and ask them.

Senator Stevens, do you have an opening statement?

OPENING STATEMENT BY SENATOR STEVENS

Senator STEVENS. Well, Mr. Chairman, I am very pleased to participate in this hearing on this reauthorization and to have been able to join you in cosponsoring the legislation that is before us. These programs are of critical importance to the citizens of my State of Alaska, who depend so heavily upon fisheries, maritime commerce, and the other activities which are the subject of NOAA's ocean and coastal research and management programs.

I am particularly interested in pursuing two aspects of NOAA's ocean and coastal programs today: The problems caused by marine plastic debris; and the oportunities for NOAA to resolve those problems through its National Sea Grant and other programs.

As you know, you and I joined with 28 of our colleagues in a letter to the President asking for his assistance in developing a coordinated strategy to resolve the increasingly serious problems resulting from the presence of plastic debris in our marine environment.

I would also request that you agree to a unanimous consent request that this letter to the President be printed in the record of this hearing to reflect the widespread concern that we have in the Senate about the problems that we addressed the President on. They are very pertinent, I think, to this hearing.

I am proud of Alaska's Sea Grant Program and have cosponsored the Sea Grant reauthorization bill to ensure its continued support and to enhance its role and focus. I am hopeful that the testimony of our witnesses today will help us identify opportunities for Sea Grant and other programs to contribute to the solution of the plastic debris and other nationwide problems that require our immediate attention and concerted action.

Mr. Chairman, I have got to state to you that unfortunately we have a teleconferencing system in my State and I am scheduled to appear before one of the Alaska State legislature's committees in 10 minutes. You have got to remember, we have a 4-hour time difference, so that it is morning up there for them.

I see that Senator Packwood is here and I am sure he has a statement. But I will be back as soon as I can. I think this is a very

important hearing. I appreciate your holding it, and I want to explain my absence here in just a few moments.

Senator KERRY. Thank you, Senator. And your requests will be placed in the record as ordered.

Senator Packwood.

OPENING STATEMENT BY SENATOR PACKWOOD

Senator PACKWOOD. Mr. Chairman, I appreciate your holding this hearing on the NOAA ocean and coastal programs. For those of us who represent coastal States, these programs are extremely important.

NOAA was created in 1970 with the primary responsibility for most of the Federal Government's civilian research, service and regulatory programs affecting the Nation's oceans and atmosphere. The functions of NOAA are critical for the sound and productive management of the Nation's ocean and coastal resources. However, the administration's budget once again proposes reductions below current appropriations levels for many of these programs, and the elimination of funding for others.

Among the casualties of the administration's fiscal year 1988 budget are the Sea Grant Program and the National Coastal Resources Research and Development Institute in Newport, OR. These programs are of particular concern to me and to the State of Oregon. I also continue to be interested in the Deep Seabed Hard Minerals Program.

Mr. Chairman, this committee has faced this situation before. Each year the administration proposes reductions in NOAA's budget, and each year the Commerce Committee and the Appropriations Committee add back funding for many NOAA programs. As chairman of the Commerce Committee from 1980 to 1984, I worked to ensure that these programs were adequately funded. I will continue to work with the other members of this committee toward this goal.

I would place a further addendum about the Sea Grant program, which we obviously are going to have to battle again, as we have had to with the administration over the past 5 or 6 or 7 years. And I would hope that we would be as successful this year as we have been in the past in continuing that program.

Senator KERRY. I thank the Senator for his comments. He has waged these battles far longer than I and has shown how to be successful. So I am sure that, with his help, this year will be a duplication of the past.

But it is unfortunate that we have to go through that, and I am sure we can explore that in the course of our questions here.

Let me correct myself. There will be two panels, and the first panel is Mr. John Carey. And naturally, you are starting out way ahead of everybody else, the Deputy Assistant Administrator of the National Oceanic and Atmospheric Administration. And we are delighted to welcome you here and look forward to your testimony.

Senator Hollings has a schedule conflict and will not be able to appear at the hearing today. I have a statement that he would like to have included in the record, which I will do so at this point.

[The statement follows:]

OPENING STATEMENT BY THE CHAIRMAN

Today the Commerce Committee and the National Ocean Policy Study will focus on the ocean and coastal programs of the National Oceanic and Atmospheric Administration (NOAA).

Once again the Administration has attempted to slash the NOAA budget for ocean and coastal research and management. I understand that the cut proposed for these programs in next year's budget is about 45% of this year's appropriation. And, once again, Congress will restore program authorizations to a level where NOAA can carry out its missions.

This little budget exercise has all the surprise element of a summer television rerun. The plot is tedious and we know the script by heart. I do not understand how this Administration can fail to see that these programs are vital for the efficient management and development of our ocean and coastal resources.

This is not to say that the fiscal decisions which must be made are either easy or routine. In light of our current national budget crisis, we must give careful consideration to allocating funds so that NOAA's responsibilities can be carried out efficiently and effectively. I question the consideration which has been given to a budget submission in which the only numbers changed from year to year are the years themselves.

This morning, Senator Pell and I, with several of our colleagues, introduced a bill to reauthorize the National Sea Grant College Program. The Sea Grant Program is an example of the type of constructive, cost-effective program which will pull NOAA through this period of tight budgets and deficit reduction. Perversely, the current Administration has attempted to terminate Sea Grant in each of the last 8 years. Today's legislation would reauthorize the program for 5 years. Authorization for the base program maintaining the Sea Grant network are set at $45 million for fiscal year 1988 and increase annually to allow for inflation, to $54 million for fiscal year 1992.

In addition, recognizing that the Sea Grant network represents a strong national research capability, the bill would initiate a Strategic Research Program. The Strategic Initiative would identify national research priorities, focusing Sea Grant's unique expertise on such areas as estuarine processes, marine biotechnology, and fisheries oceanography. Funding for the initiative would be authorized at $5 million in fiscal year 1988 and would be permitted to increase to $20 million by fiscal year 1992. I welcome the witnesses here today. I look forward to their comments on this legislation and to their suggestions for improving the Sea Grant program.

STATEMENT OF JOHN CAREY, DEPUTY ASSISTANT ADMINISTRATOR, NATIONAL OCEAN SERVICE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, DEPARTMENT OF COMMERCE, ACCOMPANIED BY DR. ALAN R. THOMAS, DEPUTY ASSISTANT ADMINISTRATOR FOR OCEANIC AND ATMOSPHERIC RESEARCH

Mr. CAREY. Thank you. Good afternoon, Mr. Chairman. Thank you for inviting NOAA to appear today to discuss our ocean and coastal program plans for fiscal year 1988. Accompanying me today is Dr. Alan Thomas, who is our Deputy Assistant Administrator for Oceanic and Atmospheric Research.

With your consent, Mr. Chairman, I would like to submit my prepared statement for the record and to summarize the main points for you.

Senator KERRY. I am learning. That is one of the most welcome things we can hear at the outset of a hearing, and indeed we will do so.

Mr. CAREY. If I may, what I would like to do is to highlight two areas: first of all, the ocean and coastal programs which are due for a reauthorization this year; and then secondly, touch a little bit on NOAA's fiscal year 1988 budget request for ocean and coastal-related programs and activities.

First of all with respect to reauthorizations, there are two ocean programs for which NOAA is seeking reauthorization. Both of

these programs will expire this year. Both expire on September 30. They are, first of all, Title II of the Marine Protection, Research, and Sanctuaries Act, which provides for ocean dumping research. The Administration supports a 2-year reauthorization of Title II and a draft reauthorization bill has been sent to the Congress.

The other ocean program up for reauthorization is the National Ocean Pollution Planning Act, which provides for coordination of marine pollution research, development and monitoring programs of Federal Departments and agencies, and a proposal to reauthorize this Act for 2 years is being reviewed within the Administration at OMB and should be sent to the Congress shortly.

Now, if I may, let me turn to the fiscal year 1988 budget. I want to assure you, Mr. Chairman and members of this committee, that NOAA remains committed to a strong ocean program. In 1988 we intend to focus our ocean programs in several major areas.

First of all, we will be moving forward with establishing the foundations of an ocean observation program to improve NOAA's capability for prediction of physical changes in the global environment over a wide range of time scales.

Secondly, we plan to strengthen our physical oceanography programs through implementation of the next generation water level measurement system and through overall improvements in the quality, accuracy, and timeliness of our ocean products.

Third, we will be expanding and upgrading our environmental data bases and assessment capabilities in support of decisionmakers' ever-increasing needs for high quality information about the environment in our coastal and estuarine areas and in the U.S. exclusive economic zone, or EEZ.

In that regard, we will be continuing with our EEZ bathymetry and mapping programs which we are conducting jointly with the U.S. Geological Survey, with an emphasis in fiscal year 1988 on areas of the West Coast. We will also be managing the NOAA fleet with the objective of increasing the efficiency of our ships to meet high priority program requirements.

We will also continue to meet our responsibilities under the Coastal Zone Management Act, including support for marine sanctuary and estuarine research system programs, and will seek to serve the needs of the U.S. ocean mining industry for a stable and predictable legal and regulatory system to support industry development.

And Mr. Chairman, if I might digress for a moment, I am pleased to report that the Commonwealth of Massachusetts and NOAA as co-Superfund trustees have achieved a settlement with AVX Corporation, which is one of the defendants in our New Bedford Harbor PCB pollution case. That settlement provides $2 million for restoration and replacement of damaged resources in the New Bedford Harbor.

Mr. Chairman, as you are well aware, as a Nation we face serious problems as a result of the sizable Federal deficit. Dealing with that problem requires difficult budget decisions.

Resource limits inevitably force us to make hard choices when there simply are not as many dollars available. Just the same, NOAA is approaching the future optimistically and we will make

every effort to apply the resources that are available to us in the best interest of the American public.

To meet that challenge, we are shifting our focus to expansion and improvement of our basic scientific capabilities, to enable us to provide timely and high quality scientific information—information of real value to support government and private sector decisionmaking.

We are directing major attention to improving our overall data management and dissemination capabilities, so that valuable scientific information and data products will be available to the right users and in a timely manner to meet their needs.

We will also be looking increasingly to State and local government and industry to join in cooperative programs to support those activities and to share the costs of those activities as appropriate. Through these efforts, we hope to build a stronger ocean program and a stronger, more responsive NOAA.

In conclusion, Mr. Chairman, I want to assure you that NOAA is ready and eager to work with this Committee on the entire range of issues of mutual concern, issues important both to NOAA and to the Nation.

Thank you, sir, and we would be prepared to answer any questions you may have.

Senator KERRY. Thank you very much. I appreciate the abbreviation.

Let me just understand that, with respect to the settlement in New Bedford—and I do not mean to get parochial this quickly, although we can do that fast around here—you are just announcing that at this point, is that correct? That settlement has not yet been——

Mr. CAREY. This has been announced. It is one of the first settlements. This is actually the first marine case that has been brought under CERCLA, under the Superfund, where the Federal Government is suing as a plaintiff trustee for natural resources. And it is a major action in which NOAA did join with the Commonwealth of Massachusetts.

Estimated damages in the New Bedford Harbor area were on the order of $52 million. We had some major electric capacitor manufacturers in that area and a history of PCB contamination. This is the first of the settlements in the case.

There is still a long way to go in completing the litigation process. There are a number of other defendants in the case, and in fact I believe the next case is scheduled up on the docket in January 1988. So it still is a protracted matter.

Senator KERRY. Let me ask you, with respect to the budget overall, this is the first go-round for this Senator on this committee. And with respect to this reauthorization, others may have asked some of these things in the past or be satisfied with respect to the process, but I would certainly for the record this year like to go into some of the choices that have been made.

You have now submitted a budget to us for NOAA that proposes dramatic cuts in a variety of different programs. I guess your total ocean and coastal office is about $151.7 million some, is that correct—171?

That is a 40 percent reduction. Now, I cannot think of a lot of programs around here that are taking 40 percent reductions, although some greater are requested, obviously. There is zero funding for some programs, and I realize that.

But given what you say about the level of commitment and the need to be moving in these, do I take it that you have submitted a 40 percent reduction request to the Department of Commerce, or did the Department of Commerce forward that request to OMB?

Where did the 40 percent figure arise?

Mr. CAREY. I think the easiest way to explain that is to look at the components of that, and there are two major components of that 40 percent that you are referring to. Those relate to the coastal zone management grant program, which is roughly $35-36 million, and the Sea Grant program at approximately the same size.

So that if one is really looking at the ocean and coastal program areas, one really is looking at those two programs as making up the major portion of that 40 percent. And certainly what those represent are philosophical differences with the need for continuing those two grant programs.

Senator KERRY. What percent total do they equal? Can you tell me? Do you know offhand, those two programs?

Mr. CAREY. Those would represent almost two-thirds of the reduction.

Senator KERRY. Have you had a chance to see the draft Sea Grant bill that has been circulated?

Mr. CAREY. No, I have not.

Senator KERRY. So you could not comment at this point in time as to the strategic research program portion of that as set out in it?

Mr. CAREY. No, I have not seen that.

Senator KERRY. Neither of you can comment on that at this point in time.

Well, what I would like to do is to be able to submit that to you and make sure we can get a comment on that in writing. And if you could do that, perhaps within the next week or so for the record, I would like to have your comments on the strategic research program as set out in the draft Sea Grant bill, so that we could get a sense of that.

And specifically, I would like to know what improvements you might suggest on it, if any at all.

Mr. CAREY. We would be happy to do that.

[The following information was subsequently received for the record:]

The Administration opposes passage of S. 1196, including the Strategic Research Program. The 1988 President's budget proposes to terminate Federal Funding for Sea Grant because it is more appropriately funded by the States.

Senator KERRY. Now, earlier this year NOAA initiated a feasibility study on using commercial charter vessels instead of the NOAA vessels for fishery research. Despite the fact that I understand this study is not going to be completed until September, you have proposed to deactivate seven ships and reduce the days at sea for seven additional ships.

That sequence of events seems a little unusual, in view of the study, and I wonder how you explain that.

Mr. CAREY. The budget proposal which is pending is based on an assessment of the higher priority activities that the agency has to carry out in the research area, in the fisheries area, and in the mapping and charting area. What the budget represents is a focusing of the resources that would be available in fiscal year 1988 on the highest priority program activities in each of those three areas.

There is also a separable question which is the question of how does one go about doing that work. Is it cheaper or more efficient to do that work through charter, or is it cheaper and more efficient to do that through the NOAA vessels which are available?

What we have done is that we have gone to the National Research Council's Marine Board, and have asked them to undertake a study to look at the development of a methodology for us. And that methodology would be available.

Senator KERRY. But that has not been done yet?

Mr. CAREY. That has not been done yet.

Senator KERRY. If it has not been done yet, if you do not have a methodology, how can you make the decision to deactivate?

Mr. CAREY. The decision to deactivate is based primarily on what we can afford and what are the higher priority programs. We still have a question for those higher priority programs that we are funding in the budget as to whether it is better to use those dollars on the NOAA vessels themselves or to use those dollars to charter.

Senator KERRY. How much is the feasibility study going to cost?

Mr. CAREY. The feasibility study is costing us approximately $70,000, to develop the methodology.

Senator KERRY. And what kind of cost savings are we looking at between the NOAA vessels versus the commercial lease possibility?

Mr. CAREY. I am not sure that I have a good answer for that right now, because that is one of the things that we are asking the Marine Board to come back to us on—to do that kind of assessment of what type of charter vessels are available in the different geographic areas around the country.

Senator KERRY. Well, what happens if they come back and tell you it is not feasible and it is more expensive and you have deactivated seven ships?

Mr. CAREY. If they come back and tell us that, I think what we would be looking at is concentrating our efforts on using the funds that we have to support the NOAA vessels to carry out that research and fisheries work.

Senator KERRY. What specific programs—and maybe you can help me understand the order of priorities here, because I am sure a lot of people who are dependent on fishery research results would love to know what is taking precedence to their interests. I would certainly like to know.

Mr. CAREY. Well, I think there are a whole series of fishery resource management decisions that are being addressed by the fisheries management councils, and there are a whole series of management plans that come up for review.

There is a need to undertake a series of fisheries resource surveys and a priority list for doing those surveys is tied to the management plans and decisions. So it is a matter of applying the ship time to those highest priority surveys that need to be done in the

Gulf or the Atlantic or the Pacific to meet those management decisions.

Senator KERRY. Are you saying, then, that the councils have signed off on this concept?

Mr. CAREY. No, sir.

Senator KERRY. Have they been asked for an opinion?

Mr. CAREY. No, sir.

Senator KERRY. Should they be?

Mr. CAREY. The councils are involved in setting the regulatory framework. What NOAA does through the National Marine Fisheries Service is provide them with the information that they need to reach those decisions.

Senator KERRY. But they are representing interests that are dependent on the results of that research. I mean, that is one of the reasons we are doing that research, is it not?

Mr. CAREY. That is right.

Senator KERRY. What do the researchers themselves think about this? What have they said to you about it?

Mr. CAREY. Well, I think if you asked the researchers, and certainly if you go across the board, you will find that there are a lot more demands for days at sea than can be met through even the existing NOAA fleet.

And again, it come back to a question of priorities—which are the highest priority research projects that will pay off in the highest dividends in terms of the research work that is coming back from those cruises?

Senator KERRY. Can you just tell us for the record what some of those other priority research projects are?

Mr. CAREY. One of those—and I would ask Dr. Thomas to comment on it—would be the research cruises that are related to the TOGA program.

Dr. THOMAS. The large NOAA ships are utilized in climate research, ocean climate related studies, with the tropical ocean global atmosphere program being the largest user of Class I or the very large NOAA ships. Now, large ships are not normally used for fisheries research. The smaller ships are used for fisheries research.

There are other climate studies related to the global ocean circulation studies that are going on. There are cruises related to understanding the role of carbon dioxide, mixing in the ocean, which is important.

Senator KERRY. Are there not cutbacks also in that area, if I recall correctly?

Dr. THOMAS. There are days at sea cutbacks in the large ships, yes.

Senator KERRY. And in the atmospheric programs also.

Dr. THOMAS. The ship reductions are across all categories of ships, large, medium and the smaller ships.

Senator KERRY. Let me, I want to pursue that a little bit. But there is something that I guess is unanswered from my initial question, because I want to get a sense of where the judgment is coming from for these things.

I asked you at the outset what recommendation was made to the Commerce Department. Did you recommend the 40 percent cut to the Department?

Mr. CAREY. No, sir.

Senator KERRY. What did you recommend?

Mr. CAREY. With respect to the fleet we had recommended supporting the fleet operations at the current level.

Senator KERRY. And it is fair to say that as to a number of other programs, that where there are cuts, you recommended otherwise.

Mr. CAREY. Yes, sir.

Senator KERRY. Would you like to be explicit now? We could go into some of those as we go along or do you want to just summarize those that you thought needed higher funding levels?

Mr. CAREY. I am not sure which ones I could go through.

Senator KERRY. Are there any that leap out at you? Any pet projects over there that you would like to see fully funded?

Mr. CAREY. I do not know that I do. No, sir.

Senator KERRY. Now do you know what level Commerce recommended to OMB? Let me shortcut this a bit. Did OMB cut back from the Commerce level or did they agree with the Commerce level?

Mr. CAREY. There were changes at each of the levels in the budget process and I think that perhaps if I might suggest that one of the things that we could do for you, since I do not have the actual numbers here with me, is to provide you for the record a comparison of the requests at each of the stages of the process and the items that were covered in those request levels.

[The following information was subsequently received for the record:]

FISCAL YEAR 1988 BUDGET SUBMISSIONS

Line item	Fiscal year 1988 requests—		
	DOC	OMB	Congress
Mapping and charting	$30,554	$28,554	$29,868
Fiscal year 1988 increases:			
ANCS II	(+1,000)	((+1,000)	(+1,000)
SDS III	(+2,000)	(0)	(0)
Geodesy			
Fiscal year 1988 increases:			
Multipurpose cadastre	(+1,000)	(0)	(0)
Dynamic GPS	(+1,000)	(0)	(0)
Fiscal year 1988 decreases:			
Carolina geodetic surveys	(0)	(0)	(−400)
Vertical control network	(0)	(0)	(−500)
Observation and prediction	39,333	12,013	13,327
Fiscal year 1988 increases:			
Circulation modeling	(+1,000)	(0)	(0)
Ocean observations	(+1,070)	(0)	(0)
Global ocean observations	(+25,250)	(0)	(0)
Fiscal year 1988 decreases:			
Marine Boundary Program	(0)	(0)	(−300)
Regional Ocean Service Centers	(0)	(0)	(−1,600)
Circulatory Program	(0)	(0)	(−350)
Chesapeake Bay Tide Station	(0)	(0)	(−20)
Estuarine and coastal assessment	12,371	9,371	8,868
Fiscal year 1988 increases: Status and trends	(+3,000)	(0)	(0)
Fiscal year 1988 decreases: Ocean Assessments Program	(0)	(0)	(0)
Coastal Management	3,602	3,602	3,845
Fiscal year 1988 decreases:			
Estuarine sanctuaries	(0)	(0)	(−1,600)

FISCAL YEAR 1988 BUDGET SUBMISSIONS—Continued

Line item	Fiscal year 1988 requests—		
	DOC	OMB	Congress
Program management	(0)	(0)	(−600)
Ocean Management	3,792	3,792	3,736
Fiscal year 1988 decreases: Marine Sanctuary Program	(0)	(0)	(−600)
Marine services	64,728	56,101	54,595
Fiscal year 1988 increases:			
Reactivate ships and increase days at sea	(+16,242)	(+9,000)	(0)
Fleet instrumentation/support equipment	(+1,285)	(+500)	(0)
South Pacific resource assessment	(+600)	(0)	(0)
Fiscal year 1988 decreases:			
Deactivate seven ships	(0)	(0)	(−7,230)
Reduce days at sea	(0)	(0)	(−1,128)
Southeast Marine Support Facility	(0)	(0)	(−300)
Fleet Rehabilitation Program	(0)	(0)	(−268)

Note: Numbers in parentheses represent budget increases and decreases included in fiscal year 1988 requests.

Senator KERRY. Okay, well I would really appreciate that, because I think it would be very helpful for us to get a sense of priorities and who is setting them and what they ought to be.

Coming back to the issue of the cuts on TOGA, you are now telling me that TOGA is a higher priority so you have got to move some of this over there. But there have been cuts in TOGA too, correct?

Dr. THOMAS. That is correct.

Senator KERRY. Now from 1982 to 1983 there occurred a tropical ocean warming event called El Nino, which resulted I gather in significant climactic changes that brought droughts to Africa, Australia, and severe storms in South America, which resulted in turn in very significant economic losses.

I believe those economic losses were put at $5 billion in the U.S., and $20 billion worldwide. Now the program you are referring to, TOGA, is part of the international effort to study and predict exactly this kind of climactic event.

So in light I do not think I have to say anything about the importance of the program. $5 billion in the U.S. $20 billion worldwide, not to mention lives and other things that are impacted by it.

How do you explain the reduction of the NOAA budget in TOGA related activities by more than 33 percent?

Dr. THOMAS. Let me just talk a little bit about the context for TOGA. It is an international program.

We, particularly in NOAA, have worked hard to set up an observing system in the Pacific that tries to observe both the oceanic and some of the atmospheric characteristics of an El Nino southern oscillation event.

In this context there are now 15 foreign countries that support various aspects of the international TOGA program, as well as the National Science Foundation which supports the university community participation in TOGA.

Within NOAA we still do, within the fiscal year 1988 budget, have funds within the requests. There is $2.5 million specifically for TOGA related activities. This is compared with the $5.5 million in fiscal year 1987.

And we have devoted some of the resources in our laboratories to support some of the measurements necessary for TOGA. So we think that we are contributing, we are trying to contribute——

Senator KERRY. Well, Mr. Thomas, I know we are. But let us come back to my question. And you have just said we have cut to the 50 percent level there.

I am not trying to depress the economy by causing any of you job anxiety in your statements here. But I do want to get at some reality.

Now is it your assessment that this is enough to do the job and contribute to the international effort, or are people internationally going to say, what is the U.S. doing? Here we have a serious climactic study effort going and they are withdrawing from it.

What does that do to the seriousness of the study?

Dr. THOMAS. There are risks associated with reducing the budget.

Senator KERRY. Would you like to see more money in there?

Dr. THOMAS. I think we are operating, we can operate quite effectively, at the requested level.

Senator KERRY. Could you operate more effectively with more?

Dr. THOMAS. We will have to make some changes in the observing system, for example.

Senator KERRY. But are you going to have to rob Peter to pay Paul in order to do that, as you have just described you are with the seven ships?

Dr. THOMAS. We are going to have to work very hard with the international community to ensure that the observing systems we have in place stays in place.

Senator KERRY. Do you want to add anything to that, Mr. Carey?

Mr. CAREY. I would only add that we are already working very closely with other agencies, with the National Science Foundation and with the various boards of the Academy.

In terms of NOAA's participation in these global and international programs, of which TOGA is one, certainly from the standpoint of these agencies, other agencies and outside scientific groups, NOAA's participation is extremely important, and it goes beyond just the funding for the TOGA program.

It goes to the capabilities that NOAA has in its observation and monitoring activities, in its breadth of scientific research programs. And to some of the ocean circulation research that we are carrying out and to our data handling capabilities. So I think that NOAA is very much involved here.

I think, as Dr. Thomas has pointed out, we have to work very hard with the resources that we have, and that is what we are trying to do—to fulfill our commitments.

Senator KERRY. With respect to that, I guess in June of last year the Earth Systems Sciences Committee released its study.

And that recommended global earth research efforts among NASA, NSF and NOAA. The administration saw fit to propose $24.6 million and $25 million to NSF and NASA, respectively. Nothing to NOAA.

Now I do not understand that. How is NOAA going to participate and keep up with the ESSC's recommendation here?

Mr. CAREY. Let me address that, from two points of view. And then Alan may wish to add another.

First of all we are in the process right now of looking very hard at the programs and activities that we have in the observation and monitoring area, in the data handling area, and in the research area, in terms of putting together a NOAA program that can be responsive to the global change efforts that were put forward in that report.

And second, within the last month, the President's Office of Science and Technology Policy has created a new Earth Sciences Committee, under the Federal Coordinating Committee for Science, Engineering and Technology.

And it has named NOAA as the chair of that White House policy level committee, which will involve all of the other Federal departments and agencies that are involved in this area, for the purpose of putting together a cohesive and coordinated Federal program on global change.

It is correct that NASA and NSF have received some money in these areas, but I think what we are really looking at right now is beginning to integrate all of these activities, including NOAA's activities and the activities of DOE, EPA and others into a cohesive program that I would see forthcoming in the next year.

Senator KERRY. Do I understand you correctly then to be saying that once again, through the creation of a new committee, we will pull together some kind of entity that, lacking the money, is going to be providing for the ingredients of this new program in the face of all the other cuts in the other programs where you are doing the same process of legerdemain?

Is that correct? I mean, I am not trying to put words in your mouth. But that is what I hear you saying. Somehow you are going to stopgap the lack of money and create something where there is nothing, while at the same time stopgapping everywhere else.

Mr. CAREY. I think that the effort has to be looked at across the board, at the resources that are going into the various Federal agency programs and activities, and how those dollars are being spent and whether or not there is a need to reallocate the Federal resources that are going into this effort.

Dr. THOMAS. I might comment, one of the things I think is important and we are working on is to make sure that we establish within the interagency group the appropriate role for NOAA, and back that up with planning and some substance.

In this regard I think we are very central to some of these global studies. You have mentioned TOGA, we have talked about that. We are proud of that and I think we are going to continue.

The issues of stratospheric ozone and greenhouse effect are two others where we already have, shall I say, at least a toe-hold in some of the key elements in those issues.

Senator KERRY. Are you saying, though, that you are going to deliver the required service for less? I mean, that is really what we are getting at. Are you going to do that? Are you going to be able to do that?

Dr. THOMAS. We think that there are a number of important things that we can deliver. There is no question that if you have more resources you can do more. That is true both in the TOGA program and it will be true in some of these other issues that we are facing.

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Senator KERRY. Did the administration know when it made the recommendations for NASA and NSF that you guys would be able to do it without money? Had they contacted you? Did they ask you? Did they say to you, we got $20 million for you. Do you need it?

Mr. CAREY. I do not think that at the time those decisions were made, there was yet the level of awareness of the issue of global change.

Senator KERRY. How do you think they came then to the decision then that it was okay to fund NASA for this and NSF for this, but we are not going to give any money to NOAA for this?

Mr. CAREY. Well I cannot speak for those agencies, but I think that some of those decisions, for example in NSF, were based on the need to provide some seed money up front for some of the basic research that needs to be started and to get underway.

There are a number of operational programs that have to follow in the sort of staging of a program like this.

Senator KERRY. Well, presumably NOAA would have some hardware requirements for the implementation of this program. Would they not?

Mr. CAREY. Yes.

Senator KERRY. What are the hardware requirements for NOAA?

Mr. CAREY. I think those fall into two categories. Into the observing network that will be needed to collect data on a global scale, and also in terms of the computer capability that will be needed to support the data management systems that will be required for the analysis of that data and information that will be flowing.

Senator KERRY. Where will that come from now?

Mr. CAREY. I think that is part of the task that the working group is tackling right now. We have had a major meeting of people just within the last two months in Princeton. There has been an awful lot of effort going into really trying to sort out all of the details of what is going to be needed.

Senator KERRY. You are proposing a reduction in funding for the marine sanctuaries and estuarine reserves by again almost 30 percent.

Would you be able to do what you need to do to create new sanctuaries with whatever is left, the available money?

Mr. CAREY. I think under the money that is left what we are looking at is the funding that would be used to continue to conduct research at the existing sites.

We would not anticipate adding any sites to the current list.

Senator KERRY. Is that because you can not financially, or because there is no need to?

Mr. CAREY. Right now we have 17 approved and operating estuarine sanctuaries, and the feeling is that we have good representation of the different biogeographic regions—9 different biogeographic regions are represented in that set.

We have been in various stages of implementing research activities in those sanctuaries, and we feel that with the $1.3 million that is in the President's request we can focus on the research work in those areas and get a good representative sample.

Senator KERRY. Will there be any reduction in the current ability to support the current programs?

Mr. CAREY. No, sir.

Senator KERRY. None.

Mr. CAREY. No.

Senator KERRY. So the only reduction there would be in the ability to have new ones?

Mr. CAREY. Right.

Senator KERRY. Did you have plans to add any new ones?

Mr. CAREY. We have an ongoing process in which we do evaluations to look at and determine candidate sites. And we will have the capability within the funding that is requested to continue to pursue those evaluations of candidate sites.

Senator KERRY. Are there any current candidate sites on the table that could be approved and made sanctuaries immediately?

Mr. CAREY. There are current sites in the pipeline that I am aware of. I do not know at what stage those are in terms of approvability.

Senator KERRY. Is there an average period in which new sanctuaries are created per annum at this point in time? Can you say, has there been?

Mr. CAREY. The 17 that we have date back to establishment beginning in 1974, roughly on the average of one to two per year. In some years we have had as many as three.

But generally speaking it has only been within the range of one to two.

Senator KERRY. Let me just pursue that very quickly, and then I want to turn to my colleague, Senator Pell, who is here

It seems to me that given the increase of problems, given NOAA's Status and Trends report, given most people's assessments of the problem and the way I assessed it in my opening statement, this seems to be the moment that we ought to be accelerating rather than diminishing the addition of sanctuaries.

Would you not agree with that?

Mr. CAREY. One of the things that we are trying to do is to look at what needs to be done in the area of estuarine research.

We are in the process and have circulated a draft framework for how to conduct estuarine research, in terms of looking at what kinds of criteria would be used to select particular estuarine habitats that we would want to go in and look at.

That is with full consultation with the scientific community. It may well be that some of these sanctuary areas are ones that we will want to go in and look at. It may also be that it is critically important to us to go into different estuarine habitats that may not be represented in the sanctuary system and to look at conducting studies in some of these areas.

So I think there needs to be a process to go through very carefully, with input from the scientific community, in terms of selecting which of these habitats and which types of research need to be done to get at some of those answers we are looking for.

Senator KERRY. Are you suggesting that you can not make a judgment today as to the need for an acceleration in the bringing on of new sanctuaries until that is done?

Mr. CAREY. I would think it would be best for us to have a good assessment first of the research framework and the criteria for selection before we move ahead with any kind of acceleration of the sanctuary program.

Senator KERRY. Senator Pell, would you like to make an opening comment and have a round of questioning here?

Senator PELL. I thank the Chairman very much indeed for the opportunity to be here.

I would like to focus if I may on the Sea Grant portion of your testimony. I joined with Senator Hollings, Chairman of this Committee, in introducing the Sea Grant authorization legislation, which is being jointly referred to this Committee, the Commerce Committee, and to the Labor and Human Resources Committee, Education Subcommittee.

I want to congratulate this Committee, Senator Hollings, and all the Members of it, for their long strong record of support for the Sea Grant program. Senator Hollings particularly has been a tower of strength, not only for Sea Grant, but for ocean programs over a period of many, many years.

For my part as the author of the legislation that established the Sea Grant Program some 21 years ago, I am very proud of what this program has accomplished. I have been happy with the general administration of the program, with the exception of course of the repeated efforts of the administration to terminate the program with zero funding.

When the Congress has made it clear though each year that it will not approve termination of the program, I believe you and the administration and the Department of Commerce and NOAA, have for the most part made a good faith effort to carry out the intent of Congress.

I would only hope for some real enthusiasm for the program, and a greater sense of priority for it within the Commerce Department. That may be hoping for too much, but I hope not.

It is estimated that Sea Grant sponsored projects are producing an annual benefit of reduced costs, expanded production, and new products, valued at almost a quarter of a billion dollars a year, $230 million a year, compared with an annual measly Federal expenditure in recent years of $40 million.

You can see what the return on that is. You spend $40 million. You increase the total product of our country by $230 million and you can see that the Federal dollar that is being spent on this program has more than come back to us in the form of increased tax dollars.

Since this program has I believe about 30 different Sea Grant college programs scattered across the country and around the Great Lakes, I do not see how the administration can think for a moment there is not the necessity for some Federal role in a program that is so national in scope.

I would be very interested in the reaction of Mr. Carey to that.

Mr. CAREY. What I would like to do is to ask Dr. Thomas, since he is responsible for that program, to comment on it for you, Senator.

Senator PELL. Mr. Chairman, I hope I am in order in asking a question as opposed to making a statement. Thank you.

Dr. THOMAS. The administration continues to maintain the position that the primary beneficiaries are State and local and private entities, and there has been no change in that position.

Senator PELL. I would hope that the administration would just simply look at the arithmetic that is involved and realize the lack of reason in arriving at that decision.

Do you have any indication, for example, that the State governments have the capacity to take over not only the Sea Grant programs but the coordination of Sea Grant programs? Is there any State government capability to coordinate and run this program?

Dr. THOMAS. None that I know of, sir.

Senator PELL. Thank you. Thank you very much indeed for this opportunity, and thank you, Senator Kerry, for your hospitality.

Senator KERRY. Thank you very much, Senator Pell. We appreciate your coming and taking part in it.

Let me ask a question for the many folks out there. When I was in the Navy, our charts were provided to us, but that is not so anymore. The price of charts is going up and up, and some folks are interested in that. It has risen since 1985 from $4.50 a chart to about $12 per chart next year.

What effect is that price increase going to have on the total revenue received by the Treasury? Can you tell me?

Mr. CAREY. The increases in the charts that are proposed will offset the direct costs of the printing and reproduction and development of those charts, but not for the collection of the data.

We are under way with the chart increases. Thus far we have seen no real impact of the increases on the sales of the charts.

Senator KERRY. It was my understanding that the increase for the charts was specifically to fund the automated nautical charting system. Is that not accurate?

Mr. CAREY. There is one piece of that which is to fund the automated nautical chart production program. That is $1 million. It adds $1 to the price of a chart.

Senator KERRY. Is that going to increase efficiency?

Mr. CAREY. Yes, sir.

Senator KERRY. Assuming that is true, can we expect that once the system is in place the chart price is going to fall?

Mr. CAREY. That cost, once that program goes in, should fall back to the normal costs that we are in the phasing, yes, sir.

Senator KERRY. Can I hold you to that with the same assurance that you are going to fulfill all these other obligations without the money, or do I believe that there is some other ingredient working here? That will happen?

Mr. CAREY. Yes.

Senator KERRY. All right.

Let me ask you a couple of questions, if I can, on an issue of enormous importance to us in Massachusetts. The administration has proposed cutting all the funding for the coastal zone management state grants. It seems to me that NOAA should be supporting the states in their attempts to manage the coasts.

What is the administration's reasoning, therefore, behind the cut in the State grants?

Mr. CAREY. Under the Coastal Zone Management Program, the Federal Government has the responsibility for working with the states to insure that there are approved coastal zone management programs under the terms of the Act.

We have provided over a number of years grants to the states, first for development of those plans and then for the administration of those plans. What is at issue is whether the Federal Government needs to continue to support the administration of that program or whether that should be the responsibility of the states.

The administration's position is that the state should be picking up an increasing share of the operation of that program in the budget for fiscal year 1988. We still propose the funding to cover NOAA's responsibility to administer the coastal zone management program and to administer, for example, the consistency provisions under the Act.

We believe that it is time for the states to pick up the day-to-day management and operation of the program.

Senator KERRY. Let me understand that, then. You say that there is a role, and that the role is limited to administration?

Mr. CAREY. Correct.

Senator KERRY. And that no money should be made available for management per se as it actually means implementation of that management?

Mr. CAREY. That essentially it represents State programs at this point.

Senator KERRY. That is the extent that you would say the Federal Government's role should be limited to?

Mr. CAREY. Limited to the coordination and the consistency provisions.

Senator KERRY. How do you view, then, the 1984 court decision of the *Secretary of the Interior* v. *California* which limits states' rights in using the coastal zone management agency to do the management? Do you support that?

Mr. CAREY. You are referring to the *California* v. *Watt* decision? That, of course, relates to one particular application of the consistency provisions with respect to whether or not they apply to the leasing process.

Under the Act and following that Supreme Court decision, the regulations have been clarified to show that the consistency provisions still apply to the exploration and development phase and to the production phase of oil and gas development.

So we are continuing to administer those parts of the act as they relate to consistency in both of those cases.

Senator KERRY. In keeping with that, do you think that if states are going to actively manage their coastal zones, and essentially it is going to be a State program and they are responsible for it, then do they need to be involved as early as possible in a major Federal activity like the OCS oil and gas leasing process? You cannot have it both ways, right?

Mr. CAREY. Well, they are involved, as I indicated, in the exploration and development phase and production phase. In the lease-sale phase, there is an opportunity for the states under section 19 of the Outer Continental Shelf Lands Act for commenting and involvement in the lease-sale portion.

Senator KERRY. Well, that is a comment. That is not really what has happened, though, is it? Let us be honest with each other. Are you really going to tell me the states have had an active role in deciding what is going to happen in the management of those

leases or in which leases are going to be put out? They have been decisionmakers? They have been partners? They have been really part of that process?

Mr. CAREY. The OCSLA section at least provides for an opportunity for a commenting period, but certainly under the Supreme Court decision that we have in front of us, we are carrying out that program consistent with that Supreme Court decision.

Senator KERRY. What you are talking about the participation in is in exploration and development; correct?

Mr. CAREY. Correct.

Senator KERRY. Exploration and development come after a lease has been signed. I asked you whether or not in the lease process—how can they manage it if they are not part of the choice of leasing? How can they be told this is your program, you are on your own, we are not going to fund you, this is the state's issue, and then say, but we are going to tell you what you can or cannot do fundamentally? You are getting the best of both worlds. Tell them what to do but to not help them do it.

Mr. CAREY. We are administering the program consistent with the Supreme Court decision and consistent with the current policies that exist on the books.

Senator KERRY. If their participation is effectively postponed until significant amounts of money have been invested, does that not grossly complicate their ability to really be players and to make choices?

Mr. CAREY. I am not sure that I am familiar enough with that to answer that question, Senator.

We are involved in working with the states and are prepared to do that, but I am not sure that I am a good one to answer that question.

Senator KERRY. Let me ask you another question. I have a chart here somewhere that I want to fill out.

This is an NOS chart of the Georges Bank area. Now, as you know, there is a limitation on exploration in areas around Georges Bank that are less than 60 meters deep, and I know you are familiar with that.

On this chart itself it shows proposed lease areas and it actually shows areas on the Georges Bank that will be subject to lease that are inside that 60-meter isobath.

Now, keeping that in mind, has the current five-year plan put out by the Interior Department in effect violated the intent of Congress in restricting what can and cannot be subject to lease?

Mr. CAREY. I would have to defer to the Department of Interior to address that question, sir.

Senator KERRY. But you are aware of the 60 meter restriction?

Mr. CAREY. Yes, sir.

Senator KERRY. You recognize this as an NOS chart, I know.

Mr. CAREY. Yes, sir.

Senator KERRY. If on the NOS chart it showed that the lease areas were actually including things that were more shallow than 60 meters, you would have to conclude there is a problem there, would you not?

Mr. CAREY. Yes, sir.

Senator KERRY. Well, maybe we can follow that up jointly somehow outside of here, because it is obviously of significant concern to us.

The reason I asked that, I am not just playing a game with this at all, but I know that EPA recommended against including certain parts of the George's Bank in that lease, an it just seems to me fundamental as we sit here talking about reauthorization of NOAA. I cannot think of an agency coupled with the States that ought to have a more active role in this.

It seems an essential ingredient to your ability to talk about ocean management and preservation and the whole concept, would you not agree with that?

Mr. CAREY. Yes, sir, and we do have a very good working relationship with the State of Massachusetts in terms of their involvement with us in the program, and they have a very good record in terms of their ability to respond on these types of issues and to work with our people here.

Senator KERRY. I hope that in this continuing effort that we will be able to cooperate and see if we can try to get a meeting of the minds on it.

A couple of final questions, because I know there are others waiting to testify, and we want to give both panels an opportunity here. I would like to keep the record open so that we can submit any unasked questions in writing to you, perhaps, and also for colleagues who are not here, and we will do so.

Your recently released Status and Trends report received an awful lot of attention in Massachusetts, and the reason for that is that all of us were pretty shocked by the extensive pollution of sediments, shellfish and fish themselves. I wondered if you could share with us here some observations about the specific pollutants that were found in Boston harbor. I ask this because we have been struggling for some time with cleanup measures and efforts, and I would like to have the record show what some of those findings are.

Mr. CAREY. Before I mention a couple of those, if I might, I would like to preface my comments by talking a little bit about the Status and Trends Program and the data that is collected under that program.

We do have a national program, and we have identified 50 sampling sites around the coast of the U.S. We have started to go back and visit those sites on an annual basis, starting with 1984. So the first report that you are looking at is the 1984 data. That is one year of data, and that is the first important point.

A second important point is that when we are looking at the pollutant levels, the contaminant levels that are showing up in the report, there are some cautions about the data. What we are characterizing is what we are finding at a particular site and that that should not be construed as applying to the entire estuary or the entire area.

When we are looking at some of the samples in some of the bottomfish, we cannot take that data for that particular species and necessarily extrapolate that to all of the fish species that are in that area. So there are some scientific limitations to the data that I think are important to understand.

What we have are relative levels of pollutants that we have found in the sediment and in the bottomfish at these locations.

The last caution I would indicate here is that in no case did we find in any of the fish, in any of the animals that were caught, any levels of pollutants that exceeded the FDA allowable levels, and I think that that is also an important point.

If we look at the 50 sites around the coastal part of the U.S.—certainly from the three surveillance sites that are located within the Commonwealth of Massachusetts, we do find the highest concentrations—again compared to the other sites in the sample survey—of aromatic hydrocarbons in the sediments in Boston harbor and in Salem harbor. They are twice as high as any other site in the U.S.

There are also very high concentrations of DDT in sediments in the samples that we found, the highest on the East and Gulf Coast areas. There are elevated concentrations of DDT that were found in the fish livers in Boston harbor.

Also, the highest concentrations that we found in the 50 sites of PCBs both in the sediment and in the fish livers that we were looking at.

Finally, again in Salem harbor this time, the highest concentrations that we found anywhere of cadmium levels.

Again, this is one-year data for 1984. Data that are relative to the other sites and in no way really should be construed as implying any risk to human health, but certainly the levels in Boston and Salem harbor and also in San Diego harbor were the three areas that were the highest relative to the other locations that we were sampling.

Senator KERRY. This is a one-year study; correct?

Mr. CAREY. It is the 1984 data. We have accelerated the process of analyzing the data that we have collected for 1985, and we, of course, have 1986 data as well.

I think the true value of the Status and Trends Program is going to come as we begin to build this historical base because not only will we have the relative indications of one site versus another site, but we will begin to develop a time series of data to see whether or not those levels are fluctuating from year to year.

So it is very hard right now on the basis of one year of data to determine anything out of that data other than factually stating what the relative levels are, one site to the other site.

Senator KERRY. So we really need more?

Mr. CAREY. Correct.

Senator KERRY. We need more information.

Mr. CAREY. We need more time series information. We also need, to go back to my earlier comments about——

Senator KERRY. Before you go back, we need more. We do not have enough information but we have some alarming information, it is fair to say; correct?

Mr. CAREY. We have some high levels in certain areas and we need to understand what that really means.

Senator KERRY. It means there are some high levels there, does it not?

Mr. CAREY. It means those levels in sediment. We do not know, for example, what implications that has for, say, the food web or

the food chain that is located in there. We do not know if we find that in particular tissue samples of fish what that really means in terms of other fish in the food chain.

Senator KERRY. If it is true that we need more and we have not even gotten the 1985 statistics analyzed yet and you have 1986 samples and they are awaiting analysis, why are we cutting the program?

Mr. CAREY. The funding level that is proposed in the President's budget would be an adequate level for continuing to do this monitoring program and to continue to sample at those sites, through perhaps not as frequently as we are currently doing and perhaps not at all of those sites.

There is some question as we go along where we have not found very high levels of pollutants whether it is really cost effective to be going back and doing that kind of field sampling with the frequency with which we have been doing it.

Senator KERRY. Are there any health hazards associated with the pollutants around there?

Mr. CAREY. Not that I am aware of, sir.

Senator KERRY. No health hazards with DDT?

Mr. CAREY. Not that I am aware of, not based on that data, no sir.

Senator KERRY. Is that because of the amount that has been found or where it is?

Mr. CAREY. It is because the data is, again, site specific to those sites where it has been collected, and the data really is not in a form that one can extrapolate that to make any implications for edible fish. That is not the effort.

The Status and Trends Program is designed to collect data, not to look at it from a health standpoint. The levels, as I say, that we have found in the animals that have been caught do not exceed the FDA levels.

Senator KERRY. Has any analysis been made by any health agency with respect to those amounts?

Mr. CAREY. If there is, I am not aware.

Senator KERRY. Your agency does not work with Public Health officials to examine that question?

Mr. CAREY. I can try to find that out for you, sir.

Senator KERRY. Are New Bedford Harbor and Buzzards Bay in similar circumstances or not, do you know?

Mr. CAREY. I do not have the listing of where they stand in the 50 sites, but we can provide you with a copy of the report for the record.[1] We will list all of those.

Senator KERRY. The Status & Trends report focuses on 44 coastal sites around the United States. Using Boston, for instance, as an example, in your experience and what you found there, have any efforts been made or will they be made by your agency to coordinate with the EPA regarding enforcement?

Mr. CAREY. We work very closely with EPA across the board in a whole series of areas. Certainly the data that comes out of the Status & Trends program are shared with EPA. We work with a

[1] The report was not reproducible and is in the Committe files.

number of EPA offices at the headquarters level. We work very closely with the EPA people in the regions, in the field, and there is good sharing of data and information and coordination between the two agencies.

Senator KERRY. Well, I think the point I make—and I am glad to hear that—is that obviously I think you are the most qualified agency to be able to help make recommendations as to what ought to be cleaned up and when and in what order and what effect it has.

And so I would hope that cooperation will increase and that it will be significant. My fear is that your budget may not be adequate to permit your active involvement in that kind of coordination and assessment. And I do not know if you want to comment on that, but it is a concern that I express.

Mr. CAREY. Again, I think we are trying to do the best that we can with the resources that are available.

Senator KERRY. In the earlier discussion that we had about the question of consistency, it seems to me that, in view of the Administration's interpretation thereof, that it is going to control the offshore oil and gas leases and make money therefrom, and yet prevent the states' initial involvement, while telling them they have got to be responsible for these other things, that maybe we are going to have to address that legislatively.

And I wonder if you have any comment with respect to that possibility or thoughts about where we might go?

Mr. CAREY. I do not think I would have any comment, sir.

Senator KERRY. I do have a few other questions, but I know that we want to move on to the other panel and so I am going to hold those off at this point.

Senator Pell, do you have any additional questions at this time?

Senator PELL. Two questions. One, I was struck with your analysis and comprehension of the status of various Rhode Island and Massachusetts estuaries. How would you characterize Naragansett Bay? Is that pretty contaminated or clear? How does it stand compared to other estuaries around the country?

Mr. CAREY. I was trying to look to see if I had something on that one, sir. I do not have an immediate recollection of Naragansett Bay. I know that we have the sampling sites and the data from there, and we would be happy to provide those for you.

Senator PELL. I wish you would provide them for the record.

[The material referred to follows:]

NATIONAL STATUS AND TRENDS (NS&T) PROGRAM—ACTIVITIES AND RESULTS IN NARRAGANSETT BAY

SUMMARY OF NARRAGANSETT BAY NS&T ACTIVITIES

The Benthic Surveillance site in Narragansett Bay was sampled in 1984, 1985, and 1986, and will be sampled again in 1988.

Two Mussel Watch sites (Conanicut Island and Dyer Island) located in Narragansett Bay were sampled in 1986 and in 1987.

The Conanicut Island Mussel Watch site was sampled in 1987 for tributyltin analysis.

Sediment and mussel samples from Narragansett Bay have been submitted to the NOAA/NBS Environmental Specimen Bank.

SUMMARY OF NARRAGANSETT BAY NS&T RESULTS

Many NS&T measurements of contaminants in Narragansett Bay fell in the "midrange" of values nationally.

Although the Narragansett Bay Benthic Surveillance site ranked in the "top ten" category for PCBs in sediment and aromatic hydrocarbons in sediment, levels observed at the site were far below maximums obtained nationally in the project. The value for PCBs in sediment at the Narragansett Bay site was over 100 times less than the highest national value (160 *vs.* 17100 parts per billion dry weight); for aromatic hydrocarbons in sediment, the level was eleven times less (2350 *vs.* 26400 parts per billion).

Values for pesticides in tissue of bivalves at Narragansett Bay sites located near Conanicut Island and Dyer Island were among the lowest for the northeast Atlantic coast.

Mr. CAREY. It does, again, vary depending upon the pollutant that one is looking at. So it is hard to generalize for the particular areas. But we do have the report.

Senator PELL. Do the best you can.

And the other question I have concerns your written statement in which you say: "We are continuing efforts to assure a broad international legal agreement to support the deep ocean mining based on U.S. law and the laws of like-minded nations."

Having been an adviser to the Law of the Sea delegations for many, many years starting in the late sixties, and having started that process with Arvid Pardo, I was just curious if you see any possibility of the United States participating with the other nations in the fairly complete Law of the Sea agreements that have been reached so far?

As you know, we are not even represented there, and I was just curious if there was any movement in the Administration in this regard, because this is really a fiction, the "agreement in support of deep ocean mining based on U.S. law and the laws of like-minded nations."

As you well know, there is nothing that has been developed along those lines yet.

Mr. CAREY. I do not know about the Law of the Sea in general, in terms of all of the provisions. But interestingly enough, there have been considerable discussions going on, both of a bilateral and a multilateral nature, with respect to the deep ocean mining areas.

There have been a series of meetings, and one is coming up, next month in Vienna, which is a follow-on to a meeting that was held two months ago in Moscow, in which several nations are getting together to look at conflicting claims, overlapping claims.

And there has been a good deal of progress that has been made in those discussions, particularly involving the Soviets, in terms of sorting that out. And the reports that I get back are that that is a very important step, that a lot of the countries are looking to, in terms of making sure that we have a stable understanding out there that can allow for efforts to move forward.

So at least on that front, it appears that there still is a lot of discussion and a lot of progress going on.

Senator PELL. All right. But as you know, what we have done is we have taken those things that we like in the Law of the Sea draft treaty and we have said what we like is customary international law, and those things that we do not like we say are not. So

we sort of pick the cherries we like and not those that we do not like.

And one of my deep disappointments, and it is over the last 20 years now, is to see how we started off pretty well and then an agreement was reached under Secretary Kissinger's aegis, and then we backed away from it for the last six or seven years.

So I would just urge all of those who have an interest in deep seabed mining and the exploitation of the resources of the seabed that we ought to really get on with developing or abiding by the Law of the Sea convention.

Thank you.

Senator KERRY. Before we excuse this panel, let me just make a comment, which I do not make gratuitously at all. I have not been here long enough to be exhausted by the budget process yet or to become so cynical as to walk away from some of the questions that I think a lot of my colleagues have shared and some have been exasperated by.

But I will tell you that I think it is really unfortunate that OMB slashed the Department, made some of the choices that they make. And I think it reflects either one of two things.

It reflects a willingness to continue to play a shell game with the Congress on budget issues, where they are going to send a budget up here which they know, because of our priorities and sense of them, they can dump on us the choices and we will wind up making them, and we will refund some of these programs and they can walk away afterwards. Or it means their priorities are really misplaced, one of the two.

And I do not want to answer that question for myself. But when it seems to me—you know, the OTA's report recently on wastes in the marine land says that we have not got a systematic process by which we are deciding which water bodies we ought to be protecting, and when I look at the issues of increased plastic pollution, and you look around at fishermen and the catches they are coming in with that are inadequate and the problems of depleted resources and the lack of knowledge about them, and I watch a lot of good scientists struggling at Woods Hole and elsewhere, it really disturbs me. In the face of large question marks about the greenhouse effect and climatic change and all the other problems that we face, that at a time when the resources are getting harder to protect, when commercial demands are more intense on all of these things, that we do not see the kind of effort that we ought to see, that I do not think the budget reflects the profound choices we must make.

And I just, I object to it. I think it is wrong. I think it plays a game either with the process here or with the American people and with our future.

And I do not know who that message goes back to or how you guys convey it. And I am not doubting your sincerity or your efforts to make things work under very tough circumstances. I understand that.

But I do think that a lot of us here would like to see a more responsible debate and a more responsible set of choices, and not be confronted with 40 percent across the board reductions and 33 percent reductions, and then witness for ourselves, read technical pub-

lications and listen to experts and learn how deep the problems are.

So again I say, I have not been here long enough to get totally excoriated by it. But I think we can do better, I really do. And I think we would all be a lot better off if we tried to.

And so on that note, let me thank you very much for coming up here. And I have no doubt that colleagues of mine with more clout than I will see to it that there is a lot more money in this budget, and hopefully we can go through this exercise making some real priority choices down the road.

On that note, let us bring the Sea Grant panel on. And gentlemen, I thank you very much for appearing, and we will leave the record open for those questions.

Mr. CAREY. Thank you, Mr. Chairman. We appreciate your interest very much.

[The statement follows:]

STATEMENT OF JOHN J. CAREY, DEPUTY ASSISTANT ADMINISTRATOR, NATIONAL OCEAN SERVICE, NOAA

Mr. Chairman, I am appearing before you today to discuss elements of the National Oceanic and Atmospheric Administration (NOAA) FY 1988 budget for NOAA's ocean and coastal programs.

NOAA's ocean and coastal programs encompass a number of the activities of the National Ocean Service (NOS) and of the Office of Oceanic and Atmospheric Research (OAR). These activities include, among others, mapping and charting; ocean and coastal resource management; operations of the NOAA fleet; ocean research; and ocean services—ranging from production and dissemination of technical products to support safe navigation to assessments of the effects of man's activities on the ocean, coastal, and estuarine environments. In my statement today I will provide NOAA's views on those ocean and coastal programs which will come up for reauthorization this fiscal year, and outline some of NOAA's current activities as they relate to our budget request for FY 1988.

OCEAN PROGRAM AUTHORITIES DUE FOR REAUTHORIZATION

The appropriations authorizations for two of NOAA's ocean programs will expire at the end of FY 1987. They are Title II of the Marine Protection, Research, and Sanctuaries Act (MPRSA); and the National Ocean Pollution Planning Act (NOPPA).

(1) Title II of the MPRSA authorized the Department of Commerce (NOAA) to carry out research on the effects on ocean ecosystems of ocean dumping and other man-induced changes. The Administration proposes that Title II be reauthorized for fiscal years 1988 and 1989. A bill to accomplish this reauthorization has been sent to the Congress.

(2) The National Oceanic Pollution Planning Act authorizes establishment of a comprehensive five-year plan for ocean pollution research, development, and monitoring to coordinate all Federal activities in these areas. NOAA is designated as lead agency under the Act, to prepare the plan, execute the coordinated Federal program, and review the budget requests of other affected departments and agencies for ocean pollution research, development, and monitoring. We will propose that the Act be reauthorized and revised for fiscal years 1988 and 1989. A draft reauthorization proposal is being reviewed and should be forwarded to Congress in the near future.

OCEAN AND COASTAL PROGRAMS AND THE FISCAL YEAR 1988 NOAA BUDGET REQUEST

Mapping and Charting

NOAA and the U.S. Geological Survey (USGS) are now in the fourth year of a joint program to systematically survey and map the U.S. Exclusive Economic Zone (EEZ). Joint EEZ project coordination has been established with USGS. The effort is intended to produce bathymetric maps and corresponding data sets using state-of-the-art survey systems onboard NOAA's survey ships. Priority areas of the West

Coast EEZ will continue to be emphasized during FY 1988 in accordance with USGS requirements.

During FY 1988 NOAA will continue to provide updated nautical charts and related navigation products for the 3.4 million square miles of U.S. ocean and coastal waters. Production of 2.5 million copies of the 975 nautical charts currently maintained will continue, and 40 hydrographic field surveys are planned for FY 1988 to support chart upgrading and revisions. Over a period of several years, the charting process will become more efficient and produce digital products needed by a wide array of users, through implementation of the Automated Nautical Charting System (ANCS–II). Our FY 1988 budget includes a request for $1 million in new budget authority to fund ANCS–II.

We propose to offset the cost of ANCS–II with a user fee increase of approximately $1 per chart. This proposal is consistent with the authority in P.L. 99–272 for NOAA to recover costs of data base maintenance, compilation, printing, and distribution of nautical products. Also in FY 1988, the second stage of user fee price increases for nautical chart program cost recovery will occur, with prices rising to an estimated $12.00 per chart. To date there have not been any adverse effects on chart sales from the FY 1987 increase.

Sea Grant

The Federal objective of the Sea Grant Program has been achieved and the states should now accept responsibility for any further funding. Twenty-one colleges and eight institutions around the country have approved Sea Grant programs that cover all coastal states and Puerto Rico. Consequently, the Administration proposes that Federal funding for Sea Grant be terminated and therefore does not support the Senate Sea Grant Reauthorization bill.

The NOAA Fleet

The ships of NOAA's fleet provide seagoing platforms for acquisition of data and information in support of our programs and those of other organizations. NOAA's objective in managing the fleet is to increase the efficiency of those ships needed to meet essential program responsibilities, while achieving savings by taking out of service those ships not required for high-priority programs. In FY 1988, 2,390 days at sea will be allocated to high priority programs, and ship rehabilitation funds will provide for rehabilitation of the proposed active fleet of 14 ships. These ships will be engaged in oceanographic research, fisheries research, nautical charting, EEZ surveying, and pollution monitoring, with some of the ships working on multiple projects.

Deep Seabed Hard Mineral Resources

While it is not anticipated that commercial-scale deep ocean mining outside U.S. jurisdiction will be achieved for some years, NOAA is proceeding with the development of commercial recovery regulations. We expect to issue those regulations in final form later this year. Also, we are continuing efforts to ensure a broad international legal agreement in support of deep ocean mining based on U.S. law and the laws of "like-minded" nations.

Coastal Zone Management

On April 7, 1986, the President signed P.L. 99–272, the Omnibus Budget Reconciliation Act of 1985, which included reauthorization of the Coastal Zone Management program through 1990. The CZM program was enacted to provide necessary seed money to initiate development and implementation of state CZM programs, subject to Federal approval requirements. This objective has been accomplished, and 29 coastal states have Federally-approved CZM programs. NOAA recognizes the importance of continued effective management and protection of the U.S. coastal zone, and the President's FY 1988 budget requests funding to support those activities which still require Federal involvement, such as maintenance of a staff to evaluate state CZM programs to assure that the programs address the national interest and remain approvable. NOAA is also requesting continued funding to support the Marine Sanctuary and Estuarine Reserve Research Programs, as discussed in the following section.

Marine Sanctuaries and Estuaries Reserves for Research

Under Title III of the MPRSA, NOAA has designated seven marine sanctuaries, and three additional sites are progressing through the predesignation process. Section 315 of the CZM Act of 1972, as amended by P.L. 99–272, established the National Estuarine Reserve Research System; previously known as the Estuaries Sanctu-

ary Program. NOAA has designated research reserves in 16 sites, and several other sites are progressing through the predesignation process. Unlike marine sanctuaries which are solely the responsibility of the Federal Government, designation of an estuarine reserve for research signifies a shared Federal-state commitment to manage the designated area.

Ocean Observations and Assessments

NOAA is now establishing the foundation of its ocean observations program to improve our capability to predict changes in the global ocean environment over a wide range of time scales. Our goal is to collect all appropriate ocean data in real-time, quality control the data, and ingest it into forecast models to improve operational weather forecasts as well as long term prediction of global change.

We are conducting an inventory and analysis of all Federal ocean data collection platforms. The purpose of this effort is to determine platform locations and the types of ocean data being collected. In addition, we will determine whether the data are used effciently to improve our prediction capabilities. The inventory also will be used in the establishment of future ocean data requirements. Furthermore, we are in the process of establishing a continuous real-time quality control procedure to ensure the accuracy of all data entered into predictive models.

In other efforts to improve our observation capabilities, NOAA is redirecting its circulation program from a field survey effort to applications of numerical models, which will support new products and services while reducing the number of field observations required. In FY 1988 model development activities will be initiated for Charleston Harbor. Tidal circulation atlases for the Delaware River and Bay and Miami Harbor—prepared from models produced in fiscal years 1986 and 1987—will be available in FY 1988.

In FY 1988 NOAA will continue to implement the Next Generation Water Level Measurement System. Fifty modern sensor units will be installed to provide real-time telemetry capability, to improve quality, accuracy, and timeliness of water level products and information. NOAA's software program called "TIDES ABC" for use with IBM-compatible personal computers allows users to acquire real-time and predicted water level data from time stations using the new sensors.

In response to increasing interest in the development of the EEZ and coastal areas, NOAA will provide information products and services for offshore and coastal areas ranging from long-term strategic assessments of national marine environmental quality issues to real-time tactical advice which can be provided during responses to spills of hazardous materials. Strategic assessment information in the form of a series of data atlases and data bases of important characteristics of major geographical areas are being prepared and maintained. A data atlas for the West Coast and the Gulf of Alaska will be completed in FY 1988. The National Coastal Pollutant Discharge Inventory and the National Estuarine Inventory also will be updated.

NOAA's Hazardous Materials Response Program has developed a mobile, computer-based information system which has the capability to provide on-site managers of emergency response activities with immediate information on hazardous materials, potential danger to persons and property, effects of environmental factors (winds, temperatures, water flow, etc.) and geographic location of support facilities and transportation routes. This capability, which was developed to aid NOAA's Hazardous Materials Response activities, has potential nationwide applications for emergency response activities such as fire, police, and rescue operations. The Seattle Fire Department, at its own expense, has tested the system and found it to be extremely effective. The system is estimated to cost about $25,000, including a portable computer, sensors, and a data base management system. NOAA intends to make this technology available for transfer to the private sector.

National Marine Pollution Program Office (NMPPO)

NOAA has responsibility under the National Ocean Pollution Planning Act for establishment and support of the National Ocean Pollution Policy Board ("the Board") and coordination of Federal marine pollution research, development, and monitoring programs. The Board was established in FY 1986, and the NMPPO will continue its staff support for the Board in FY 1988. During FY 1988 the Board will be promoting interagency coordination in the areas of nonpoint source pollution, loss and modification of critical coastal habitats, and pipeline discharges in coastal areas. The Board has prepared a report on the FY 1988 budget of all agencies to support marine pollution research, development, and monitoring activities. The next update of the Federal 5-year plan for Ocean Pollution Research, Development and

Monitoring, which describes the status of the Federal effort and identifies priority research and monitoring needs, will be submitted in September 1988.

In conclusion, I want to assure the Committee that NOAA is eager to work with you on the entire range of ocean and coastal issues of mutual concern—issues important both to NOAA and to the Nation. Thank you.

[The following information was subsequently received for the record:]

U.S. DEPARTMENT OF COMMERCE,
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION,
July 15, 1987.

Hon. ERNEST F. HOLLINGS,
Chairman, Committee on Commerce, Science, and Transportation, U.S. Senate, Washington, DC.

DEAR MR. CHAIRMAN: We are pleased to respond to additional questions resulting from the March 13, 1987 hearing on NOAA's ocean and coastal programs.

If you, or your staff, have further questions, please let me know.

Sincerely,

B. KENT BURTON, *Director.*

Enclosure.

Question 1. The recent OTA report, *Wastes in the Marine Environment*, concluded that a systematic framework is missing for deciding which waterbodies requrie additional management efforts.

What agency should take the lead role in such an identification process? What is NOAA doing to identify estuaries and coastal waters that need additional management to reverse or prevent degradation?

Answer. NOAA has already taken the lead among Federal agencies in this identification process through current activities such as the National Status and Trends Program and the continuing development of the National Estuarine Inventory. The NS&T Program now in its fourth year of field and laboratory operations has collected and analyzed samples of fish and sediments at 50 coastal and estuarine sites and samples of bivalves (mussels and oysters) and sediments at 150 sites. Concentrations of synthetic organic chemicals and heavy metals have been determined. The National Estuarine Inventory has identified about 100 of the most important estuaries of the USA and for each has already assembled data on physical and hydrologic characteristics (e.g., freshwater inflow, salinity regimes, and flushing rates), land use, wetland types, shellfishing restrictions, nutrient discharges, and is now developing pesticide discharges to each estuary. This information was used heavily in the preparation of the recent OTA report and is being used by NOAA and EPA to identify jointly priorities for additional estuarine assessment and management.

Question. What is the projected schedule for these efforts?

Answer. The National Status and Trends Program is conducted annually. The next major report on NS&T results will be completed by september 1987. The National Estuarine Inventory is a continuing program with many components already completed. A new reprot on nutrient discharges to estuaries of the USA will be completed by August 1988, and a reprot on pesticide discharges will be completed by June 1988. A related effort to construct a national data base on wetlands will be completed during 1988.

Question. Suppose that NOAA was directed to develop critieria for ranking waterbodies and to identify waterbodies needing additional management, and to complete this task within 6–12 months. Could current NOAA projects be used?

Answer. Current NOAA projects are being used to do this now in cooperation with EPA. A report on results could be completed within 6–12 months, but any attempt to rank estuaries should be a continuing one as new information and assessment capabilities become available.

Question. What additional resources, if any, would be needed?

Answer. Congress has already provided resources to EPA through the Clean Water Act to be passed to NOAA to implement this responsibility. If EPA transfers these funds to NOAA, no new resources are needed.

Question. Could NOAA use its extensive quantitative data bases in such a short timeframe, or would such a process require more qualitative judgements?

Answer. NOAA's extensive data bases could be applied in a short timeframe, but any interpretation of these data necessarily require qualitative, scientific judgements. NOAA has, both internally and through its access to the external scientific

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community, the expertise to apply qualitative judgements to these data in a rigorous and systematic manner.

Question 2. Programs under the Coastal Zone Management Act generally have not addressed the management of pollution problems in estuarine and coastal waters.

Should the CZM's focus on development and land-use issues be extended to encompass waste disposal activities and effects, or would that amount to duplicating other efforts by NOAA, EPA, and the States?

Would, for example, the Massachusetts CZM program be an appropriate vehicle for taking the lead in coordinating Clean Water Act management conferences?

Alternatively, should they be considered as one of many interested parties that can participate in such conferences?

Answer. The FY 88 budget proposes that Federal funding be terminated for CZM because this program is more appropriately financed by the States. The comments below pertain to State-financed CZM programs, many of which are already in place.

Generally, the management of pollution problems in estuaries and coastal waters is only one of many issues addressed by State-funded CZM programs. The level of State CZM involvement in this issue varies based on the organization of State governments and the degree of the problem.

Some State-funded CZM programs have been actively involved in work addressing pollution problems in estuaries and coastal waters. For example, the South Carolina Coastal Council, in cooperation with Regional governments, has undertaken the upgrading of § 208 water quality plans for the coastal area, has and is continuing to supplement the State's water quality agency's monitoring efforts along the coast, and is actively involved in addressing non-point source problems such as stormwater and sediment.

A major effort of North Carolina's coastal program is also non-point source controls. This includes the drafting of stormwater management regulations by the Coastal Management Commission which led to the eventual adoption statewide by the Environmental Management Commission of sedimentation control regulations.

The new focus of Florida's CZM program is estuaries. Although the State has supported management activities in estuaries during the past, upcoming activities will better coordinate the projects of networked agencies, with maintenance and improvement of the estuaries as the main goal.

Another example of CZM involvement in this area is in Massachusetts. The lead CZM agency, the Executive Office of Environmental Affairs, has taken the lead in cleaning up the Boston Harbor. They have addressed the management of water quality problems and were the primary motivation for major new sewage treatment plants to clean up the Harbor waters. In fact, the Commonwealth had three full-time employees working in this area before the legislation was passed.

State-funded CZM programs would be one of several good institutions to take the lead in coordinating Clean Water Act management conferences because of the States' efforts in estuaries. Also, they would assure that the research that is conducted will be oriented toward real management problems and issues as opposed to private research agendas for scholars. They would also be in a position to ensure that the research conducted is actually implemented instead of sitting on a shelf.

Question 3. The Administration has again submitted a budget to Congress for NOAA that proposes dramatic cuts in a variety of programs. The President's request for NOAA's National Ocean Service and Office of Oceanic and Atmospheric Research totals $157,171,000, a cut of around 40 percent. What level of funding did you request from the Department of Commerce? What level did the Department forward OMB?

Answer. The requests were as follows:

	Requested from—	
	Department of Commerce	OMB
National Ocean Service	$106,453,000	$72,133,000
Oceanic & Atmospheric Research	117,563,000	92,213,000
Total	224,016,000	164,346,000

Question 4. Since 1985, the price of nautical charts has risen from $4.50 per chart to an estimated $12.00 per chart next year. What effect do you expect this increase to have on the total revenue received by the Treasury?

You propose to raise the price of nautical charts by $1 per chart in order to offset the expense of implementing the Automated Nautical Charting System. Yet, you also indicate that you expect this system to increase efficiency. Can we expect that once the system is in place, chart prices will drop?

Answer. The price of a conventional nautical chart in 1985 was $5.50. On June 25, 1986, the price was increased to $7.25 as a result of Public Law 99-272. The sales data to date indicate that this price increase has not had a negative effect on nautical chart sales. During FY 87, $2,145,537 (as of April 10, 1987) in chart sales revenue had been deposited in the Treasury. Public Law 99-272 requires that NOAA achieve 100% recovery of data base management and compilation costs over not less than three years. The President's FY 1988 Budget assumes recovery of some 99.8% of those costs through implementation of the next price increase on October 1, 1987.

The majority of NOAA's nautical charts are maintained manually as hard copy graphics. The implementation of the Automated Nautical Charting System II (ANCS II) is necessary for NOAA to handle the large volume of digital marine geographic information relating to maps and charts using automated methods. The results of full implementation of ANCS II will be the availability of government certified digital data sets to support electronic chart systems being produced by the private sector; a much improved capability to provide tailored data sets in support of special uses, e.g., highlight all information shallower than a certain depth in support of high speed navigation by U.S. Coast Guard vessels assigned to drug interdiction; and a significant reduction in the effort required to maintain chart data within the data base. ANCS II also will allow NOAA to issue new chart editions more frequently, saving users considerable time and expense in applying corrections to their charts. Until ANCS II is fully operational, NOAA faces the added burden of "building" the digital data base. The need for an integrated system requires that it be developed over a reasonable time period of about 4 years. After this is done, the chart maintenance effort is expected to drop to 10 to 20 percent of present levels. While this may translate into a decrease in chart prices, it will probably serve to mitigate future price increases.

Question 5. I understand that the Administration proposes to terminate funding for the current Sea Grant program. I would like you to comment on S. 1196 and on the Strategic Research Program contained in the bill.

Answer. The Administration opposes passage of S. 1196, including the Strategic Research Program. The 1988 President's budget proposes to terminate Federal funding for Sea Grant because it is more appropriately funded by the States.

Question 6. Once again, the Administration proposes a reduction in pollution assessment and monitoring programs (this year about $5.8 million). Included in this cut is part of the National Status and Trends Program. In light of the recent OTA report, *Wastes in the Marine Environment,* which calls for increased coastal monitoring, how do you justify this reduction?

Answer. During this time of increasingly difficult tradeoffs on the use of available resources, the Administration has higher priorities. The funding requested in the President's budget will provide for the maintenance of an adequate level of coastal monitoring.

Question 7. (A) I understand that the Ocean Services Program was established to improve the prediction of physical changes in the ocean. Please explain how this program could contribute to NOAA's global environmental research effort.

(B) A cut of $1.6 million (85 percent) has been proposed for this program in the Administration budget. What activities would be cut by the proposed reduction?

(C) How would the cuts affect global research efforts?

Answer. (A) The dynamic components of global climate are the atmosphere, ocean, and ice cover. Each of the these components interacts strongly with the other. The ocean circulation is forced by wind stress and by exchange of heat and moisture with the atmosphere. The atmospheric circulation is forced by the pattern of atmospheric heating, for which ocean heating is the most important variable. Ice cover on the oceans regulates exchange of heat and moisture between the atmosphere and ocean and is in turn regulated by the atmosphere and ocean. To model and predict the future state of this highly coupled interactive system, the evolving state of the system must be observed on a systematic basis. On short times scales, measured in days, the circulation and thermal condition of the atmosphere are the most important factors that determine the future evolution of the system. The world weather observing systems are designed to perform this function. On longer time scales, measured in months, the most important factors are the circulation of the ocean and the heat content of its upper layers. The global observing systems to measure these ocean features are now taking shape as prediction on monthly time scales becomes more feasible and more urgent. Ice cover on the ocean is now rou-

tinely monitored by satellite. The most economical and effective measurements for monitoring the evolving ocean circulation and thermal state are sea level and the temperature structure of the upper ocean. The temperature structure reflects oceanic heat content and its availability to the atmosphere. This can be measured most cost effectively be a program of voluntary observing ships (VOS), drifting buoys, and SEAS employing expendable and recoverable subsurface temperature sensing systems. Sea level reflects both the heat content and the circulation of the upper ocean. A combination of the two measurements can provide a very economical system for monitoring the evolution of the ocean circulation and thermal condition, the crucial features of climate variability. These data are collected in NOAA to contribute to the global environmental research effort.

(B) In FY 1987, Congress allocated a total of $4.2M for the Office of Ocean Services: $2.6M by way of transfer from NESDIS and $1.6M in new budget authority. A reduction of $1.6M is proposed that would eliminate the funds added by Congress in FY 1987. As stated in the FY 88 budget proposal, a cut of $1.6M would not seriously impact the Ocean Services Program. Analysis and dissemination of data will continue through the existing NOAA field structure.

(C) To be fully successful, the global research effort requires both coordination and long-term continuity on a global scale. As stated in answer (B), NOAA will continue selected activities under the requested funding level. Data analysis and dissemination to global research efforts will be continued through use of the existing NOAA field structure.

Question 8A. In June 1986, the Earth Systems Sciences Committee (ESSC) released the results of a 3-year study recommending a cooperative global earth research initiative among NASA, NSF, and NOAA. Please comment on the ESSC report. Do you feel that their recommendations provide an effective research strategy for examining the problems of global climate change?

Answer. The first ESSC report was well received in NOAA. Obtaining a scientific understanding of the entire Earth System on a global scale is an ambitious goal, but one which NOAA shares. While a second more detailed report is due toward the end of this year, we do not believe that the ESSC documents will embody a specific research strategy. This strategy needs to be developed by the agencies concerned. NOAA, having a strong research component which supports its lead environmental analysis and prediction mission, will no doubt play a major role in forming the research strategy for global change.

Question 8B. What role do you see NOAA playing in this effort? What is NOAA doing to implement some of the recommendations?

Answer. NOAA's mission to predict the environment is tied directly to a fundamental goal of global change and that is to achieve reliable assessments and quantitative predictions of changing global climate. Although NOAA has been actively pursuing this goal since its inception, NOAA is now undertaking a systematic review and planning effort to see how we can focus as much attention as possible on this important problem using our present resources.

Question 8C. What cost estimates are available and what benefits are expected from following the ESSC research strategy?

Answer. Since much of NOAA's existing programs support climate and global change, we are focusing our efforts on more effective utilization of existing resources. Given a national response to the overall program strategy as provided by ESSC, we should expect important benefits to our economic well-being, our competitive position in world markets, the health and safety of our people, and the security of our Nation.

Question 9: Parts I and II. The Administration budget proposal for FY 1988 contains new global research initiatives for both NASA and NSF. I understand that a similar global research initiative was developed by NOAA, but that the proposal was stopped at the level of the Commerce Department.

What reasons were given for not including the initiative in Commerce's budget submission? Does NOAA's position within the Department of Commerce reduce its ability to contribute to global research efforts?

What was the projected cost for a NOAA global change program in FY 1988? What were the major programmatic elements of the proposed initiative?

Answer. An initiative specific to global change was not submitted by NOAA in FY 88. However, a substantial portion of the NOAA FY 88 budget package included elements relevant to a global change program. Many of our ongoing programs in oceanic and atmospheric observations; data collection, processing, and analysis; long-term monitoring; focused research; predictive modeling; and information management comprise a substantial and unique Federal capability and serve as the foundation for NOAA's contribution to a national global change program (e.g., RITS,

TOGA, GMCC, ocean observations, ocean-atmosphere modeling, National Data Centers).

NOAA and the Department of Commerce are currently discussing the specific programmatic elements associated with participation in an integrated global change program as part of the FY 1989 budget process. The principal focus of NOAA's participation in such a program will continue to involve prediction of climate change on a range of time and scales. The Department of Commerce has a long history of support for global climate programs such as TOGA, RITS and GMCC.

Question 9: Part III. How will ongoing NOAA data collection and research activities contribute to future global change programs?

Answer. The National Oceanic and Atmospheric Administration's (NOAA) primary mission and statutory responsibility is to predict significant changes in the oceanic and atmospheric environments on a wide range of time and space scales. Thus large segments of NOAA's ongoing operational and research programs are directly or indirectly related to climate change, including the "greenhouse effect", and stratospheric ozone depletion. these issues require investigation of a climate system that includes interactions of oceans, atmosphere, land and ice surfaces, and the effects of human activities with knowledge of solar variability which influences the entire system.

NOAA's unique responsibility for environmental monitoring is critical to NOAA's climate studies and to research performed by others. Improvement of observational and data management activities has and will continue to provide a basis for improved environmental prediction.

NOAA's Office of Oceanic and Atmospheric Research conducts a coordinated and integrated program of global climate reaearch. some important components of this program are:

The Tropical Oceans and Global Atmosphere Program
Climate modeling research
Ocean circulation studies
Radiatively Important Trace Species

A major component of the climate research program is the international Tropical Oceans and Global Atmosphere (TOGA) program, which focuses on interannual variations in climate. NOAA is the lead agency in this program which includes investigations of the physics and dynamics of the coupled ocean-atmosphere system in equatorial oceans and its relationship to interannual variability of global climate. TOGA research (which includes NOAA, other-agency, and university and international investigations) has as its ultimate goal to improve predictive capability on the interannual time scale. A key part of the TOGA program is, Equatorial Pacific Ocean Climate Studies (EPOCS), an investigation begun in 1979; it involves a broad spectrum of oceanic and atmospheric measurements, diagnostics and modeling of the tropical Pacific. The total TOGA program could serve as a model for the NOAA program in longer term climate predictions which are relevant to the greenhouse warming issue.

Dynamics of climate change on longer time scales will be based on the experience gained during Subtropical Atlantic Climate Studies (STACS) which identified the processes that contribute most to the poleward transport of heat in the North Atlantic Ocean and developed the technology to monitor them operationally in other regions of the world.

A foundation of the climate research program addressing the decadal and longer term climate variability issue will be NOAA's Geophysical Monitoring for Climate Change (GMCC) program. This will provide high quality, long-term measurements of carbon dioxide and other atmospheric trace constituents which significantly affect earth's radiation budget, as well as meteorological measurements to assess climate variability and determine long-term trends. GMCC will operate remote monitoring stations (at Alaska, Hawaii, Samoa, and South Pole)—one tropical and one high latitude in each hemisphere—to provide baseline observations for global air quality monitoring. These will be supplemented by several specialized monitoring networks operated by groups from the U.S. and other nations.

The NOAA climate modelling research program, conducted mainly at NOAA's Geophysical fluid Dynamics Laboratory, will provide the basis for developing mathematical models of the atmosphere, oceans, and coupled system. The atmospheric studies have three emphases:

Description of the dynamical interaction between large-scale wave disturbances and the general circulation of the atmosphere.

Identification of the physical and dynamical mechanisms that maintain climate and cause its variation.

Evaluation of the effects of human activities on climate.

Ocean circulation studies, also central to climate research, will address the following:

The large-scaled response of the ocean to atmosphere forcing over a range of time scales from weeks to decades.

Ocean observational studies of the structure and distribution of various tracers and development of models of the world's oceans. These include global sea level measurements which are currently based on water level measurements.

Interpretation of results in terms of a coherent hydrodynamical and thermodynamical framework.

Development of a capability to predict the large-scale behavior of the world's oceans in response to changing atmospheric conditions.

One of the most vigorous of these original studies, modeling of the El Nino-Southern Oscillation phenomenon in association with EPOCS, has already resulted in the transfer of a model of the Tropical Pacific Ocean to the National Weather Service and to researchers at other NOAA laboratories.

In FY 1985, NOAA expanded atmospheric chemistry studies with a new research program, Radiatively Important Trace Species (RITS): Trends and Mechanisms, that focus on a unique set of trace species in the atmosphere that are both radiatively and chemically active. The environmental issues that these species pose are twofold. First, it has become clear that carbon dioxide is not the only "greenhouse" species. There are others, such as chlorofluorocarbons (CFCs), methane, ozone (in the lower atmosphere), nitrous oxide, and water vapor (in the stratosphere). If these increases continue, it is estimated that the global "greenhouse" warming from these gases will be as great as, and additive to, that expected from the carbon dioxide increases. Second, these species, unlike carbon dioxide, are chemically reactive with other species in the atmosphere. Indeed, many of these species are the principal actors in atmospheric chemistry, in particular, stratospheric ozone chemistry.

The RITS program will enable NOAA to perform the following four major research activities:

Long-term monitoring, as part of the GMCC program discussed above, to determine the temporal trends of the radiatively active trace species.

Chemical studies to understand the key reactions that form and remove these species.

Global transport and source/sink investigations to determine how the species are distributed throughout the atmosphere and how they are emitted from or lost to surface areas.

Model development to assimilate the source, sink, chemical, and transport information into a theoretical framework that can explain the observed RITS trends and distributions and predict possible future climatic and chemical effects from natural or human-induced changes in the abundances of the radiatively and chemically important trace species.

RITS will also include a component which is investigating the role of the oceans as a natural source of atmospheric chemicals. Results to date suggest that the oceans may play a much larger role than originally expected since oceanic biota produce a large suite of highly reactive chemicals.

The NOAA RITS program is a keystone in both national and international global chemistry and climate research programs.

Other NOAA programs indirectly related to climate research include ocean prediction and observation, air sea interaction research, space environmental research which addresses the solar-terrestrial environment, and cloud and precipitation research.

Question 9: Part IV. Concern has been expressed within the scientific community that NOAA represents a "weak link" in any interagency effort to study and understand global change phenomena. Please comment.

Answer. NOAA should, in no way, be described as the "weak link" in national efforts to understand global environmental change. NOAA's unique role and contribution derive from our primary mission and statutory responsibilities to predict environmental changes on a wide range of time and space scales and provide related data, information, and services to the public, industry, the research community, and other agencies. Many of our ongoing programs in oceanic and atmospheric observations; data collection, processing, analysis; long-term monitoring; focused research; predictive modeling; and information management comprise a substantial and unique Federal capability and serve as the foundation for NOAA's contribution to a national global change program (e.g., RITS, TOGA, GMCC, ocean observations, ocean-atmosphere modeling, National Data Centers).

NOAA scientists and program managers, for example, remain at the cutting edge of global climate research efforts on "greenhouse warming", radiative gases and the

El Nino Southern Oscillation (ENSO) phenomenon. NOAA will continue to exercise this intellectual and programmatic lead.

Question 10. The NOAA Administrator, Dr. Calio, was recently named by the President's science advisor to chair a new Committee on Earth Sciences. I understand that this committee will coordinate federal research efforts in Earth sciences, identify policy and international issues and provide recommendations to the director of the Office of Science and Technology Policy.

Part I. Does Dr. Calio bring any goals or objectives to this new position?

Answer. It is true that Dr. Calio now chairs the FCCSET Committee on Earth Science.

The Administrator's primary goals would be first, to base the allocation of precious research dollars on national needs and scientific objectivity. The Committee will be charged with ensuring a cooperative interagency effort to avoid duplication and focus scarce resources on the highest priority needs. Lastly, the Administrator believes that a goal of operational prediction in seasonal and annual time scales is possible. If the scientific agencies can give policy makers the kind of capability they need to deal with dislocation caused by climate change, we can begin to deal with the massive challenges posed by climate changes.

Question 10: Part II. Does this appointment signal a recognition within the Administration of the importance of NOAA's contribution to global earth research? Will it result in increased Administration support for NOAA?

Answer. Recognition by the Administration of NOAA's unique role and mission in climate and prediction services would appear to be implicit in selection of NOAA leading the interagency Committee on Earth Sciences.

Question 11. Please outline the progress and activities of the NOAA Task Force planning a climate and global change program for the agency.

Answer. The Task Force on Climate and Global Change was convened in late March. This resulted in a major conference of agency scientists at Princeton, to begin the process of determining the research priorities and direction of the proposed program. The Princeton conference resulted in a large set of priorities, which are currently being reviewed and distilled. In May, the Task Force was primarily engaged in determining the highest near-term priorities for the program and assigning proper budget allocations to those priorities.

Question 12. Access to data and data compatibility are two potential problems in such an interdepartmental and interagency research program. Are any efforts under way to anticipate data management problems?

Answer. Access to data and data compatibility are two important concerns that will be addressed under the broader topic of data management. NOAA provides a lead Federal role in data management, and already has active interagency data management coordination underway with, for example, the U.S. Geological Survey and the National Aeronautics and Space Administration. In an effort to anticipate multi-agency data management problems, NOAA is convening an ad hoc working group for data management and global change. This interagency group will set the stage for exploring and solving problems such as: common access to agency environmental catalogs; standards for data exchange; interagency data access procedures; international data exchange strategies; and performance of data system.

Question 13. (A) Although NSF is the lead agency for World Ocean Circulation Experiment (WOCE), NOAA will likely play some role in WOCE—what do you expect that role to be?

(B) Will NOAA research vessels be required to support WOCE? How will their availability be affected by the proposed budget cuts?

Answer. (A) Emphasizing the global scale of the climate problem, WOCE is a large-scale oceanographic study that involves internationally coordinated programs of satellite measurements, conventional in-the-water studies and computer modeling. The major planned activities of WOCE include but are not limited to: satellite observations of sea surface elevation and surface winds; a global sea level measurement network; large quantities of moored and drifting buoys; a ship-based program for global observations; a WOCE data management system; and computer modeling of the global ocean.

The planned programs of investigation within WOCE will consist of both national and international contributions that are provided by participating institutions and nations. NOAA participation in WOCE includes: Satellite observations of sea level, topography and marine winds; *in-situ* sea level measurements supported by VLBI and GPS leveling for absolute measurements; NOAA fleet platforms for ship-based programs; automated reporting of shipboard observations via SEAS systems; data telemetry via GOES and ARGOS, quality control and archiving; *in-situ* conventional observations and process studies; and interactive air/ocean computer modeling.

NOAA is participating in the WOCE planning effort and is adding its experience based on field programs such as Tropical Ocean Global Atmosphere (TOGA) and Sub-tropical Atlantic Climate Studies (STACS) to the planning effort.

(B) NOAA's WOCE progam has been allocated 26 days-at-sea for FY 1988. NOAA plans to make Class I ship time available to support WOCE activities. The DAS will be allocated on a priority basis. Class I ship time will be needed, and there will be no impact on availability of Class I ship time due to the proposed DAS included in the FY 88 budget.

Question 14. What is the status of NOAANET and NOAAPORT?

Answer. The 1988 President's budget includes a funding request for planning of the development of NOAAPORT. If approved, the fund will be used for acquisition of GOES remapping capability and formatting data. NOAANET was the title of the program to address the access to data issue as posed in your Question 12. The current status is presented in our answer to Question 12.

ANSWERS TO QUESTIONS SUBMITTED BY SENATOR STEVENS

Question 1. You discuss Title II of the Marine Protection, Research and Sanctuaries Act and the National Ocean Pollution Planning Act on pages 2 and 9 of your statement.

Those statutes call for research on the effect on ocean ecosystems of man-induced changes, and for a five-year plan for ocean pollution research and coordinated federal activities.

The Chairman and I, along with 28 other Senators, have written the President asking him to help coordinate federal efforts to deal with the problem of marine plastic debris. Yet, very little research is being done on the effects of plastic on the ocean ecosystem, and plastic debris has been treated as one of the lowest priorities in the five-year plan for ocean pollution research.

What can NOAA do under these and other authorities to deal with the plastics problem and coordinate federal efforts to resolve it?

Answer. Besides Title II of the Marine Protection Research and Sanctuaries Act and the National Ocean Pollution Planning Act, NOAA has other statutory authorities with which to address the problem of marine plastic debris. Those sources include the Fishery Conservation Management Act, the Endangered Species Act, the Marine Mammal Protection Act and the Sea Grant Authorization Act.

For each of FY 1986 and 1987, the annual appropriation was $750,000. NOAA's Marine Entanglement Research Program addresses four broad areas: (1) source of plastics (including plastic containers, bags, pellets, fishing gear, cargo straps, 6-pack yokes and bait bags that are found in the oceans and along our coasts; (2) extent of mortality to wildlife caused by plastics in the marine environment; (3) efforts to educate the public about plastic pollution problems; and (4) practical means for the reduction of plastics in the oceans, such as ocean waste management systems (incineration and compaction) and photo- and biodegradation technology.

Due to the recognition of increased importance of this problem and the fact that the next five-year plan is due in September 1988, NOAA is convening a marine debris workshop June 10–11, 1987. Representatives from Federal agencies, States, public interest groups and industry will be present. The workshop will focus on three major questions: (1) What will decision-makers need to know? (2) What additional research is needed? and (3) What coordinated Federal efforts are needed?

Further, on a national level, NOAA is leading an interagency working group which includes representatives from over 10 federal agencies and departments. The working group is analyzing issues related to marine plastic pollution.

Question 2. I am told that Marconi is conducting, under contract, some of the offshore survey and mapping work for USGS and NOAA, which you discuss on page 2. I understand that they were interested in making their vessels and acoustic detection equipment available to you to detect lost drift nets floating at sea and mark them to be retrieved by other vessels.

Was NOAA able to take advantage of that opportunity?

Answer. NOAA and USGS are cooperating in the conduct of surveys of the U.S. Exclusive Economic Zone (EEZ). Under the agreement, USGS is conducting a rapid initial reconnaissance survey of the EEZ using the GLORIA (Geological Long Range Inclined Asdic) side-looking system, which provides an image of the seafloor but not detailed bathymetry. NOAA participates using NOAA ships, conducting multibeam surveys to international standards providing detailed bathymetry (actual shape of the seafloor) for use with the imagery in making geological interpretations. NOAA uses these data to improve maps and charts. USGS obtains the GLORIA data through a contract with the United Kingdom's Institute for Ocean Sciences, which

developed the GLORIA system. USGS owns the GLORIA system being used to survey the U.S. EEZ. Marconi, a private firm, operates another GLORIA system and has been interested in using it to find lost drift nets. Their initial approach was to locate drift nets on the bottom, but they are not likely to be discernible and the problem is to locate those floating at sea. The use of GLORIA to do so is fraught with problems. GLORIA would have to be towed deep, which it is not designed to do, in order to obtain any significant width of coverage by looking upward toward the surface. To tow the system deep would require that the tow vessel speed be significantly reduced making any such search inefficient. Further, if the system was oriented to look toward the surface, high backscatter return would make it difficult to identify drift nets. Due to the significant technical problems and probably high cost of using this approach, NOAA is not involved with Marconi.

Question 3. The Sea Grant statute directs the Secretary to "establish long-range planning guidelines and priorities for, and adequately evaluate" the Sea Grant Program (Section 204). It also directs the Secretary to "identify specific national needs and problems and authorizes grants and contracts for work on those needs or problems," (Section 206).

Has NOAA established such "priorities" for attention by Sea Grant: If so, what are they?

Has NOAA identified such "national needs and problems?" If so, what are they?

Has NOAA asked Sea Grant institutions to direct their efforts at solving particular problems?

Why would it not be appropriate to identify work on the marine plastic debris problem as a "priority" and "national need" requiring concerted action?

Answer. For the last several years the President's budget has proposed termination of the Federal funding for the Sea Grant program because this program is more appropriately financed by the States. Since the Congress has continued to fund Sea Grant, the following activities have been carried out:

The Director establishes priorities for the National Sea Grant College Program and distributes them annually.

NOAA has identified national needs and problems on three different occasions. These were published in the Federal Register.

NOAA works with Sea Grant institutions continuously to coordinate efforts to solve problems in the marine resource field. This has included recent joint planning for research to improve our understanding of fisheries stock recruitment and oceanography, sea floor venting processes, estuarine dynamics and quality, and toxic contaminants in coastal waters.

Work on the marine plastic debris problem was listed as a national need and problem in the Federal Register listing dated September 15, 1986 (Item Number 26).

Question 4. You say on page 4 of your statement that you propose to reduce funding for NOAA's research vessels so as to provide 2,390 days at sea for "high priority programs."

Please provide for the record: the number of NOAA's research vessels and days at sea during the past four years;

Answer.

Fiscal year	Number of ships		Days-at-sea
	Active	Inactive	
1983	22	1	4,336
1984	22	1	4,196
1985	22	1	3,805
1986	21	2	3,641

Question 4 (continued)—the lower priority programs that would not be conducted as a result of the reduced funding that is proposed.

Answer. We would not provide at-sea support to the Status and Trends program. We would continue to provide support to NOAA's other program areas including oceanographic and atmospheric research, living marine resource assessment and research and mapping and charting but at a reduced level of days-at-sea.

Senator KERRY. For the record, the members of our Sea Grant panel are: Dr. David Ross, Sea Grant Director, Woods Hole Oceanographic Institution; Mr. Ronald Dearborn, Director of the Alaska

Sea Grant College Program; and Dr. Tom Bright, Director of the Sea Grant Program, Texas A&M University.

Gentlemen, we welcome all of you, and I leave to you to decide who will go first, in what order. And I think what we will do is just roll right through all of your statements and then come back for a period of questioning.

STATEMENTS OF DR. TOM BRIGHT, DIRECTOR, SEA GRANT PROGRAM, TEXAS A&M UNIVERSITY; RONALD K. DEARBORN, DIRECTOR, ALASKA SEA GRANT COLLEGE PROGRAM; AND DR. DAVID ROSS, SEA GRANT DIRECTOR, WOODS HOLE OCEANOGRAHIC INSTITUTION

Dr. BRIGHT. Thank you, Mr. Chairman.

I am Tom Bright, Director of the Texas Sea Grant program, and I very much appreciate the opportunity to speak to this committee concerning Sea Grant reauthorization. Sea Grant is an organization of 29 regional programs comprising a national network of over 300 universities and affiliated institutions performing marine research, advisory services, and education focusing primarily on the coastal estuaries and coastal margins.

The coastal focus is appropriate for us because this is the region of greatest potential for food production, minerals, recreation, and living space. It is also the area with the most serious environmental and resource problems.

Sea Grant fosters economic stability in coastal communities by encouraging economic development, environmental protection, aquaculture, fisheries, tourism, recreation, and various other coastal enterprises. We do this through a partnership between universities, industry, and government, engaging in competitively funded research, technology transfer, and education directed to the needs of the coastal constituency.

The 1986 Packard-Bromley report to the White House Science Council emphasized the need for just such an approach. It also recommended increased funding for university-based research as an aid to economic growth.

Sea Grant has a similar philosophy. Consequently, we have generated many economic benefits over the past two decades. This is the basis used by Congress to preserve the program. When efforts began to terminate it in 1981. At that time the economic effects from the Sea Grant program were calculated at about $227 million per year. That is slightly less than the total Federal Sea Grant budget for the previous 13 years. The program and its economic benefits are summarized in a recent Sea Grant Association publication.

Concern for economic competitiveness has led to a proposal to double the National Science Foundation budget over the next five years, and to create university-based science and technology centers that would have close ties to industry, perform innovative research, and transfer economically useful technical information.

We support the National Science Foundation proposal, but we wish to point out that its operating rationale is very similar to that of Sea Grant. The need to stimulate economic competitiveness

argues both for reauthorization of Sea Grant and for increased Sea Grant funding.

Sea Grant is the nation's primary vehicle for estuarine and coastal research. We have identified several research initiatives which could generate significant benefits in the near future. These include marine biotechnology, particularly new biological methodologies for enhancing aquaculture and fisheries ocean technology for exploration and development of the exclusive economic zone; studies of estuarine processes; studies of toxic substances; and fisheries oceanography.

With some targeted new funds, Sea Grant could stage immediate and productive research activities in these fields through its proposed national strategic research initiative.

Sea Grant funding has suffered in the past several years. Considering inflation, most programs have experienced cuts in excess of 30 percent. Sea Grant dollars have declined, even though the overall NOAA budget has increased 20 percent over the past five years. The fiscal 1987 Sea Grant programs are operating at a level below the across the board cut level for fiscal 1986. The number of projects supported by Sea Grant is off by one third and, significantly, graduate student involvement in Sea Grant programs is down.

Mr. Chairman, for our core program we are asking for restoration of cuts and inflationary compensation. It would take $50 to $54 million now to match the buying power of the 1981 appropriation of $42 million. We are requesting additional funding for our strategic research program and maintenance funds for the international program.

Naturally, we would like to see higher appropriation levels than appear in the Senate bill. Nevertheless, if the reauthorization measures now in the bill are actually implemented, we look forward to a signficant increase of Sea Grant productivity in the future.

I thank you for listening, and we hope you will continue to support our program.

Senator KERRY. Thank you, Doctor.

[The statement follows:]

STATEMENT OF DR. THOMAS J. BRIGHT, DIRECTOR, SEA GRANT PROGRAM TEXAS A & M

Thank you, Mr. Chairman and good afternoon. I am Thomas J. Bright, Director of the Texas Sea Grant Program.

I appreciate the opportunity to testify before this committee on the reauthorization of Sea Grant. I speak on behalf of the Marine Division of the National Association of State Universities and Land Grant Colleges (NASULGC) and the Sea Grant Association. Consideration of reauthorization is a time to assess the efficiency of the program's past and to shape its future. We believe that Sea Grant plays an important role in this nation's civilian efforts to effectively use the ocean and Great Lakes resources and environment.

The Marine Division of NASULGC is composed of 90 major marine research and education institutions in the United States. They are committed to the understanding, conservation and development of the ocean and coastal environments. The Sea Grant Association consists of 40 colleges, universities, research centers, industries and consortia, all dedicated to enhancing the nation's capability to develop, use and manage our marine resources. Between the two bodies, we represent most of the nation's academic and, indeed, total civilian, marine research, education, outreach and technology transfer capacity.

On behalf of the Sea Grant network, I would like to thank you, Mr. Chairman, and the members of this committee for your strong support over the years. We are deeply appreciative.

I wish to briefly address the following items today:

1. The Sea Grant Record;
2. Sea Grant's Relationship to the National Economic Competitiveness;
3. Sea Grant's Role in Future U.S. Ocean Research and Policy;
4. A New and Improved National Sea Grant Program; and
5. Reauthorization Levels.

THE SEA GRANT RECORD

The Sea Grant program fills a unique niche in American marine science activities. The Sea Grant programs have developed a responsive network of institutions and scientists. Today the nationwide network comprises 22 Sea Grant colleges and seven institutional programs. Together they manage a network of more than 300 universities and affiliated institutions, including a number from inland states.

This broad and effective network was created in a remarkably short span of time. Sea Grant began as an experiment with only partial models as a guide. But it has managed to combine research, education, technology transfer and public service in a university-based program designed to enhance and promote the wise use of Great Lakes and marine resources. The first programs were located at major marine-oriented universities. But soon institutions that

originally were not part of the traditional marine community were participating and making major contributions.

Although some viewed Sea Grant as just another oceanography program, it soon became apparent that Sea Grant was much more. It concentrated on the use and protection of resources. It focused largely on the nation's estuaries and coastal margins, partly for logistical reasons. But more importantly, these are the most productive regions for food, minerals, living space and recreation. They are also the regions where the most pressing resource and environmental problems occur. Sea Grant confronted the opportunities and problems facing our society, whether economic development, environmental protection, introduction of new fisheries, or other marine enterprises. And the network brought new disciplines into the broad field of marine studies: biochemistry, genetics, microbiology, immunology, pathology, toxicology, pharmacology, engineering, law and policy studies, food science, agricultural economics, and other specialty disciplines. More radically, Sea Grant helped unite many disciplines into multidisciplinary and interdisciplinary research and educational strategies.

And always, the network recognized the need to transfer research knowledge to those who needed it through outreach education, technology transfer and communications.

More than these institutional achievements, what is important is that Sea Grant has produced many economic benefits and offers a continuing capability to address major national priority concerns. Outside analyses have shown that Sea Grant is a cost-effective, highly productive program.

ECONOMIC COMPETITIVENESS

A product of the 1960s, Sea Grant embraced and pioneered many of the now-accepted strategies of the late 1980s. Now society is again looking to the universities for ideas that will lead to technological and economic developments and for solutions to environmental or resource conflicts. Among Sea Grant's timely attributes are the following:

* a broad, multidisciplinary approach;
* a combined university/industry/government partnership;
* a network of institutions operating across the nation;
* a capacity for technology transfer and feedback.

Competitively funded, university-based research always has been America's unique contribution to the ongoing scientific revolution. Current national science policy is returning to the country's roots and re-emphasizing old themes in new settings. A recent report, widely known as the Packard-Bromley report ("A Renewed Partnership," a Report of the White House Science Council, Office of Science and Technology, Washington, D.C., 1986), emphasizes the need for multidisciplinary, university/industry/government partnership approaches to science. These are areas where Sea Grant offers a model. This report calls for increased investment in university-based science as a fundamental base for economic growth and competitiveness.

The current scale of activity and the needs are greater than ever, but the theme is not new. (Remember the land grant college system and agricultural research and extension.) From its 1966 beginnings, economic competitiveness has been a major rational of Sea Grant. Indeed, the economic benefits of the program were the main arguments that led Congress to preserve Sea Grant when attempts to terminate the program began in 1981. The Sea Grant network showed then that selected economic benefits resulting from the program equaled $227 million per year -- nearly as much as the total federal appropriations over the previous 13 years. A 1982 study found that a sample of projects funded in 1975 had stimulated annual sales (just one measure of economic benefits) in excess of $44 million, or more than the highest annual federal funding level ever reached by Sea Grant. Since 1981, reports on these and other benefits have been publicly and regularly issued.

Mr. Chairman, there are many examples from the Sea Grant network to emphasize this theme. My own Texas program has been a leader in efforts to develop a shrimp mariculture industry in the United States. Working marine shrimp farms now exist in Texas, South Carolina, Florida, Hawaii and Puerto Rico. Competition in the marketplace with imported shrimp products is fierce. Sea Grant is now engaged in research and information transfer on shrimp reproductive processes, selective breeding, bioengineering and intensive culture. This is directed toward providing a technology-based impetus and competitive edge to our fledgling U.S. shrimp mariculture industry.

Industry representatives have credited the Washington and Oregon Sea Grant programs with reviving the West Coast oyster industry and helping to make it profitable. Sea Grant helped introduce the hatchery system that has largely replaced dependence on Japanese oyster seed and has helped produce better strains of oysters as a result of genetics research. From being in the red, the industry has grown to $30 million annually. Now we have introduced a polyploid oyster that keeps its taste year-round, so that you can eat high quality oysters during the "non-R" months.

The oyster effort actually involves researchers in Maine and Maryland, as well as Oregon and Washington, and additional advisory service work in California. Developments in one place are rapidly picked up and improved upon in another, then re-exported. Sea Grant has assisted in the establishment of an experimental oyster hatchery in Texas to take advantage of the existing research and technology for enhancing the fishery.

In California, Sea Grant research has led to 17 patents on marine compounds with major potential as medical drugs. We are just beginning to scratch the surface in this and other areas of marine biotechnology.

An example of a different kind of impact can be found in the Great Lakes area. Sea Grant research, publications and advisory efforts are helping property owners along thousands of miles of Great Lakes shorelines (afflicted by record-high water levels) save millions of dollars through changed tax valuations and through avoiding expenses on useless shoreline protection gimmicks. They are also helping localities and property owners introduce useful protection measures where applicable and to plan better for the future. As an aside, in keeping with the idea that the Great Lakes serve as a laboratory for the ocean, the effects of rising water levels seen now on Great Lakes shores may be a forerunner of the effects of the expected increases in sea level during the next century.

"Beach litter is an economic problem for coastal states. Each year, municipalities spend significant amounts on beach maintenance and beach trash collection. More importantly, the image of litter-strewn beaches tends to inhibit their recreational use and impairs development of coastal tourism as a much-needed economic base. Beach cleanup activities and studies sponsored by the center for Enviromental Education and Sea Grant in Texas indicate that a majority of Texas beach litter is derived from disposal of garbage and trash at sea by vessels and offshore platforms operating in the Gulf of Mexico. In addition, as you may know, Texas Sea Grant has made a distinguished contribution to the protection of sea turtles, and we are concerned that marine plastic debris not be a further threat to endangered species. Solutions to these problems are being sought at the local and national and international levels through legislations, treaties, education and regulation relating to disposal of solid waste at sea."

One could continue a long list of economic, environmental and human accomplishments that enhance this nation's competitiveness.

The focus on economic competitiveness has led to a proposal to double the National Science Foundation (NSF) budget over five years and to create a number of Science and Technology Centers. The multidisciplinary centers will be university-based and provide important links with industry. They will transfer research and technology that is scientifically exciting and economically significant.

The Marine Division of NASULGC and the Sea Grant Association endorse the recommendations for NSF. We want to point out, however, that the Centers appear to have the same operating rationale as Sea Grant, which has developed a very successful nationwide mechanism to address such efforts. The overall economic competitiveness approach would appear to justify not only continuation of Sea Grant, but also an increase in funding.

FUTURE U.S. OCEAN RESEARCH AND POLICY

Sea Grant is the nation's principal source of university academic research in the coastal oceans and estuaries. It is a primary national resource for information on water quality, aquaculture, marine biotechnology, coastal engineering and ocean policy. Sea Grant serves as a vital link between marine science and public policy. From its beginning, a problem-oriented focus has made the program multidisciplinary in approach and has allied it with industry and government.

Moreover, Sea Grant is the primary U.S. agent for research on the Great Lakes. Apart from the intrinsic value of these waters, the Great Lakes also serve as a laboratory for improving scientific knowledge about vital aspects of the larger ocean environment. In particular, they provide new understanding about the fates and effects of toxic chemicals in the environment and the ecosystem approach to fisheries.

A national phenomenon, based on a growing, unified concern about global

environmental change, is becoming the focus for a new initiative in ocean sciences. Some environmental changes that arouse interest are the result of natural phenomena. However, it is the impact of man-made changes on the environment and the need to understand their influence on natural processes that cause the greatest concern and impel many ongoing efforts. Such impacts, or possible impacts, include ozone depletion, the "greenhouse effect" and its accompanying sea level rise, overfishing of stocks, habitat destruction, and the release of toxic chemicals into the environment. Because of their complexity, it is impossible to understand these concerns in isolation.

Sea Grant has important capabilities for the broad marine science agenda. The program has maintained a long tradition of fundamental, multidisciplinary work that is central to the broad global change initiative. And it has established a role as the nation's coastal ocean science and technology program. Consequently, Sea Grant can provide a vital link between global ocean research, man and the shoreline. The program can perform work needed on coastal ocean and estuarine processes. Because Sea Grant projects operate in every coastal state and virtually every coastal county, the network of scientists and institutions also offers the capacity for providing "ground truth" for remote sensing activities.

In addition, Sea Grant is the primary academic home for research on marine fisheries. It fosters interaction between scientists, fisheries management agencies and fishermen. The network has provided key reserch on fisheries recruitment, critical habitat and other factors crucial to the study of biological productivity. Although ocean lithosphere studies reach far beyond Sea Grant's mission, Sea Grant is a major force in the study of fates and effects of toxic substances in the marine and aquatic environments. Sea Grant work in ocean technology already has begun to play a role in ocean ridge crest process studies. And Sea Grant investigators are involved in the study of an accelerated environmental change "experiment" of natural and man-induced impacts in the Great Lakes. These studies offer the most comprehensive scientific base for the study of change now available.

THE NEW AND IMPROVED SEA GRANT

The proposed Strategic Research Program in Sea Grant, along with other proposed changes in the authorizing legislation, will increase the Sea Grant network's existing capabilities. The network can increase its contributions to economic competitiveness and expand its studies into global change and critical ocean, coastal and Great Lakes problems.

The bill proposed by Senator Hollings and this committee strengthens the existing Sea Grant program and increases its capacity for dealing with the issues of competitiveness and ocean and coastal change mentioned earlier. If the final legislation builds from these bases, the result will be a substantial increase in our national understanding and development of marine resources.

I would like to explain briefly the Strategic Research Program, which is a critical element for the future productivity of the Sea Grant network. This depends, of course, on an adequate funding base.

The program would:

-- establish sound criteria for developing research priorities in areas of national need;

-- provide targeted support for three to five efforts that are above and beyond current Sea Grant capacity;

-- utilize the existing management, programming and institutional capabilities of the Sea Grant network to facilitate the implementation of the program;

-- use flexible mechanisms to achieve the goals of the program; and

-- fit very logically in the context of Sea Grant goals and universally acclaimed national goals.

We have suggested some examples that are uniquely poised for immediate return on research investment:

Marine Biotechnology, with emphasis on the use of emerging biological techniques in aquaculture, food production, and new marine products;

Ocean Technology, for exploration and development of the Exclusive Economic Zone;

Estuarine Processes, a national experiment on fundamental estuarine functions;

Toxic Substances, as they affect living marine resources and human health; and

Fisheries Oceanography, including the use of satellite remote sensing, modeling, and other new technology to predict shifts in fishery stocks.

One of the analogs for the Strategic Research Program might be the Defense Advanced Research Projects Agency (DARPA), one of the more innovative and effective research funding mechanisms at the federal level. DARPA targets funds for promising areas of strategic need and/or opportunity, and identifies them on a rolling, five-year basis. The effect on the broader defense research effort has been considerable.

The research areas discussed in the Sea Grant bill are items of intense national interest. They are also areas in which creative initiatives and planning are taking place in the scientific community. Sea Grant could implement significant research efforts in these areas within a short period of time. Several would involve substantial marine policy efforts; others, scientific and engineering endeavors. Some would also require cooperative undertakings with various other parts of NOAA and with other agencies, such as NSF, ONR and EPA.

Mr. Chairman, the proposed Strategic Research Program and other innovations will help build a stronger Sea Grant program. We are certain that the investment will pay dividends for the country as a whole.

REAUTHORIZATION LEVELS

Mr. Chairman, as background to the discussion of authorization levels, I would like to note what has happened to Sea Grant over the past several years:

* Nearly every Sea Grant program has cut operations. Cuts extend to all areas of the program -- research, education, advisory services and management. At the institutional level, these cuts exceed 30 percent.

* The national Sea Grant office determined that the total number of projects supported has declined by one-third, even as federal administrative costs continue to rise. More seriously, the number of graduate students involved has declined significantly. These graduate students are essential to our future technology base.

* During FY 1987, the Sea Grant institutions will operate at a level below the across-the-board-cut level of FY 1986.

* Total dollars for Sea Grant have declined even as NOAA's budget has risen by 20 percent in the past five years.

* In recent years, inflation has taken an additional toll of approximately 20 percent. Since inflation in the sciences and in the universities has substantially exceeded the average inflation level in recent years, the effect on Sea Grant has been greater.

Our point is not that this process has been painful, but rather that these cuts have hit a highly productive program.

We have asked for some restoration of cuts and inflationary costs since 1980. Depending on whether one uses the Consumer Price Index or the OMB multiplier as a guide, it would take between fifty and fifty-four million dollars to equal the buying power of the FY 1981 appropriation of $41.8 million. The Senate bill calls for $46 million for the core program in FY 1988, with modest inflationary increases thereafter. We would, of course, like to see a higher figure, but the important point is that a fairly modest restoration of cuts and costs will make a big difference in what Sea Grant can accomplish.

We had proposed an initial appropriation of $10 million for the Strategic Marine Research Program, rising to $25 million over five years. The Senate bill starts at $5 million, rising over five years to $20 million. Again we would prefer the higher figures, but the sums in the bill would yield a credible effort. Should the actual figures end up lower, it will be difficult to mount a program of any breadth. We realize that the Congress is looking at an essentially level domestic budget, but this program so clearly touches on national priorities that we hope it will receive the same kind of consideration that is being given to the proposed increases in the National Science Foundation budget.

The $1 million level proposed for the International Program would allow for a meaningful international component to supplement key Sea Grant efforts on critical marine and Great Lakes resources.

If the proposed authorization levels can be turned into an appropriations reality, we believe that you will receive in turn an even more productive Sea Grant program.

CONCLUSION

Mr. Chairman, despite some difficulties, with the assistance of the Congress we are a stronger program than we were before, and we are building for the future. The proposed reauthorization measures would significantly increase the opportunities for achievement in that future. We are deeply grateful to you, the members of this committee and your staffs, for your support. We appreciate the opportunity to comment on these matters and to work with you.

Sea Grant College Program
Texas A&M University • College Station, Texas 77843-4115
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May 29, 1987

Senator E.F. Hollings
United States Senate
Committee on Commerce, Science, and Transporation
Washington, D.C. 20510-6125

Dear Senator Hollings:

It is my pleasure to answer the questions concerning Sea Grant posed by you and Senator Stevens in your letter of May 20, pursuant to the recent National Ocean Policy Study hearing.

Q. What can the Sea Grant Program network do to help solve the problem (of beach litter and plastic debris) and how can we help?

A. Texas Sea Grant is cooperating with the Texas General Land Office, the Center for Environmental Education and coastal counties and municipalities to address the problem of beach litter and plastic debris. A cooperative beach clean-up campaign is carried out each year to encourage public awareness of the issue and to provide some numerical information concerning the amount of litter on our beaches. In 1986 over 124 tons of litter were collected. Sea Grant marine agents serve as beach captains for these clean ups, which are sponsored by the Center for Environmental Education.

Sea Grant and the Texas General Land office are jointly producing a documentary video film and public service announcements on the subject. The Summer, 1987 issue of our quarterly magazine, TEXAS SHORES, will be devoted to beach litter and erosion. Sea Grant has sponsored research to determine the sources, probable trajectory and amounts of beach litter washing ashore in Texas.

We are supportive of Texas Land Commissioner Gary Mauro's efforts to eliminate solid waste disposal in the Gulf of Mexico through provisions of the MARPOL treaty.

Please see the attachment for more details.

Q. Do you attend the Gulf of Mexico Fishery management Council meetings?

A. I am a member of the Gulf of Mexico Fishery Management Council, Special Scientific and Statistical Committee for Coral Resources. As such, I attend meetings and respond to issues relating to coral reefs, reef habitats and coral resources. I am also a member of the GOMFMC Habitat Advisory Committee.

Mr. Gary Graham, Sea Grant fisheries specialist, is a member of the GOMFMC Reef Fish Stressed Area Panel and will attend a June 15th meeting at the council office in Tampa.

Dr. Sammy Ray, a member of the Texas Sea Grant Inter-University Planning and Review Committee has served on the Council since 1977, attends meetings, and communicates closely with us.

Q. How do the institutions decide how to spend the research funds they receive, and coordinate so as to avoid duplication of their efforts?

A. Research proposals which address Sea Grant's goals and objectives are solicited every two years by the Texas Program. These are first reviewed locally with the aid of scientists, administrators and advisory personnel. Selected proposals are then reviewed by the National Sea Grant Office to assure compliance with national goals and avoid duplication of effort between programs.

Q. Mr. Dearborn indicates in his statement that a Committee of Sea Grant Directors has been established to discuss and coordinate efforts on fisheries oceanography. Is such a committee of directors unusual, or do you meet often to develop coordinated plans, divide responsibilities, and avoid duplication of efforts?

A. This is not unusual. The Council of Sea Grant Directors meets approximately four times each year to discuss common issues and problems, develop cooperative programs and in general to assure efficient inter-program communication. The chairmanship of the council rotates yearly among the Sea Grant Directors. An Executive Committee of seven elected members with staggered terms assures continuity of operation.

In addition, our Sea Grant Association functions as a national planning mechanism for the Sea Grant Network through committees composed of Sea Grant Directors to address special issues, opportunities and research initiatives.

I very much appreciate the opportunity to inform you of Sea Grant activities. The Sea Grant Community, and the constituency it serves, thank you for your support.

Sincerely,

Thomas J. Bright
Director
Sea Grant College Program

Texas Tackles Trash

The issue of marine litter in Texas has attracted a growing awareness among state agencies and the general public in the past year. The Center for Environmental Education sponsored a coastwide beach cleanup day this past fall that not only helped rid Texas' beaches of trash and debris, but also brought a great deal of attention to the unsightly and dangerous effects of trash, especially plastics, in the water and on our beaches.

Realizing that beach trash costs the state of Texas $14 million a year in cleanup costs and innumerable marine life, the General Land Office of Texas recently has taken on the marine litter problem as a pet project. Commissioner Garry Mauro has developed an anti-litter campaign for Texas beaches and is pushing for ratification of Annex V to MARPOL (the International Convention for the Prevention of Pollution from Ships) to prohibit dumping of garbage from vessels in international waters, and other similar legislation that would reduce the marine litter problem.

The Texas A&M Sea Grant College Program is involved in this important issue by cooperating with these agencies and others, and through its many programs and projects in the areas of research, communications, education and advisory.

Research

Texas Sea Grant is currently funding research to determine the seasonal pattern of debris and litter washing ashore on Mustang Island Gulf beach by analyzing data collected almost daily over the past three years. Researcher Tony Amos, who has studied this area of the Texas coast for nine years, and an assistant are currently performing statistical and graphical analysis on 750 estimates of some 40 categories of natural and man-made debris items. He also is correlating the local meteorological, oceanographic and tidal conditions with the occurrence of debris and litter on the beach.

We feel this research will aid coastal city and county leaders and highway department personnel in planning their beach-cleaning activities. The data also will provide a good source of statistics on the types and quantities of litter arriving on Texas' beaches.

Amos' research proposal is included in this package of information.

Education/Advisory

The majority of Sea Grant's efforts at tackling the marine plastics debris problem has been in the area of education and advisory programs and projects. Because the problem we are dealing with is not "plastics," but "the improper disposal of plastics in the environment," we have concentrated our efforts at public awareness of the issue.

Listed below are a few of the efforts conducted by our education and advisory programs.

- **Surfside Beach Program** – Texas Sea Grant's Marine Advisory Service began tackling marine litter as early as 1978 in the Freeport/Surfside area. Marine Agent Charles Moss estimates that the 19-mile streich of beach in his area receives 1.5 tons of garbage from offshore each day. Over the years, Moss has coordinated annual beach cleanup efforts, initiated an adopt-a-beach program (before the statewide campaign began), and helped organize an anti-litter "beach patrol."

  Moss says the patrol is a covert, non-confronting group that cruises the beaches seeking out litterbugs. When an offense is discovered, these volunteers will track down offenders' addresses through bits of trash or license plates. All offenders receive letters reminding them that their litter kills fish and wildlife, and costs local taxpayers $150,000 per year.

  Moss gives about 140 talks per year on the harmful effects of marine litter. He also is currently working with his local officials to monitor the offshore industry's disposal of trash, with tournament directors to encourage proper trash disposal by fishermen, and with leaders in the commercial shrimping industry to monitor shrimp boat garbage.
- **Statewide Shorelines Conference** – Two MAS personnel are organizing an April 10 workshop for community leaders on developing and enhancing coastal beaches, bays and waterfronts. Keynote speaker, Commissioner Mauro, will speak on marine litter.
- **Discussions/Talks** – The MAS agents and specialists are often asked to give talks on the harmful effects of marine litter. One agent has compiled a group of slides vividly depicting marine life that have been killed by plastic trash.
- **Youth Work** – Through marine camps, field days and various 4-H activities, the MAS educates Texas youth about marine litter's effects and encourages them to take to the beaches in cleanup projects.

- **News articles** -- One marine agent has written about the marine litter problem several times in a weekly column on marine topics which he writes for his local newspaper.
- **Bay Bottom Cleanup** -- The Cameron County marine agent helped organize and is serving on the board of a committee devoted to cleaning the local bay of all trash and debris. Already, $14,000 has been raised and used in cleaning up the bay. For their efforts, the organization received the "Conservation Group of the Year" award from the Sportsmen's Club of Texas.
- **Tournament Directors** -- Several marine agents are working with tournament directors to educate sports fishermen about marine litter by establishing fishing tournament rules making it mandatory to present their trash before weigh-in.
- **Texas Coastal Cleanup Day** -- The biggest marine litter program that Sea Grant was involved in this year was the Texas Coastal Cleanup Day, sponsored by the Center for Environmental Education in September, 1986. Three marine agents and a marine specialist acting as zone coordinators, organizing the cleanup project in their respective areas. Other marine agents assisted the effort by recruiting people in their area and by discussing the project with the media. MAS plans to play an active role again in this year's Cleanup Day.
- **Marine Education Symposium** -- Texas Sea Grant each year sponsors a symposium for high school students on marine related topics. In the past few years, several lectures, a video-showing and a panel discussion on marine litter have taken place. Also, exhibitors from conservation-related groups have explained the harmful effects of plastics to marine life. The last two symposium programs are included in this package.
- **Marine Education Newsletter** -- Marine litter, especially plastics, has been the topic of several articles in this Texas Sea Grant newsletter, which has a circulation of about 5,000 and goes to educators in all 50 states. Several issues are enclosed.

Communications

In addition, to the Marine Ed. Newsletter, our Marine Information Service has produced and distributed several publications on marine litter and offers others on request.

- *Texas Shores* -- This quarterly magazine (circulation 7,000) has reported work by MAS on marine litter projects in several issues. In our most recent issue (winter), the inside front cover was used as a public service ad, discouraging the improper disposal of plastics in the water. In keeping with our marine issues thematic approach with this publication, *Texas Shores* will investigate the topic of marine litter in its summer issue, covering all aspects of the problem. Several issues are enclosed.
- **News Releases** -- The MIS office has released several news reports on work by Sea Grant concerning marine litter. A few are included in this package.
- **Videotape** -- MIS has a copy of the tape "All Washed Up," focused at the offshore industry. This tape is made available free of charge to any groups who wish to discourage improper disposal of litter. The tape discusses what happens to items that are accidentally or purposely thrown into the water.

Cooperative Efforts

Texas Sea Grant has been involved on several levels in assisting agencies, officials and other decision-makers in the marine litter issue.

- **Land Commissioners Office** -- Most recently, Texas Sea Grant has been woking with Commissioner Mauro's office to increase the public's awareness of the hazards of marine litter. See letter enclosed.
- **Center for Environmental Education** -- In addition to the efforts by Texas' Marine Advisory Service during Texas Coastal Cleanup Day, Sea Grant also played an active part on CEE's Coastal Cleanup Steering Committee. A marine agent and a Sea Grant administrative assistant were members of the committee that developed the post-cleanup report and recommendations for actions concerning Texas beach trash.
- **Gulf Region Communicators Meeting** -- Texas communicators pledged their support to an idea for an anti-litter campaign that was tossed about at the 1986 regional communicators meeting. A preliminary discussion of possible publications was held, but no initiative has been taken thus far.
- **Agents Work** -- Texas Marine Advisory Agents continue to be instrumental in providing information and resources to legislators and conservation and environmental groups interested in discouraging marine litter.

Mr. DEARBORN. Mr. Chairman, I am Ron Dearborn, Director of the Sea Grant College Program at the University of Alaska, and I speak to you on behalf of Dr. Donald O'Dowd, who is President of the University. Several commencement exercises in Alaska this week, occasions of great joy and great importance to the University, prevent him from being with you today.

Sea Grant has changed the academic institution. The University of Alaska is a young institution. The State of Alaska is even younger, and we expect change. Many of the changes that Sea Grant has brought to the University of Alaska, however, are similar to those which Sea Grant has brought to universities around the nation.

Sea Grant has brought a resource and policy context to studies which were previously thought of only in the context of science. Sea Grant has brought new disciplinary talent to coastal resources use and has united those disciplines into multi-disciplinary and interdisciplinary research and educational strategies.

In Alaska, the University has a tremendous responsibility to provide the education and research base for economic development. Because fishing is the largest private employer in the state of Alaska, Sea Grant plays an especially important role.

A critical element in doing this is networking, a Sea Grant hallmark, networking between the university and its constituencies in industry, government, and the public at large, between and among disciplines within the institution, and especially between programs across the nation.

It is the national nature of Sea Grant that creates this networking opportunity, and we continue to get better at it.

Sea Grant focuses on new issues, such as marine debris. In 1984, the network of Pacific Sea Grant college programs and the National Marine Fisheries Service developed an important conference in Honolulu, Hawaii. The proceedings of that conference on the fate and impact of marine debris is now the standard reference on that subject and an important early step in focusing on plastic debris.

Since that time, Sea Grant programs around the nation have joined with others in educational programs focused on this issue. For their marine debris program in Texas, Dr. Bright was recognized on behalf of his Sea Grant program by the Center for Environmental Education here in Washington. In Newport, Oregon, Sea Grant has joined with municipal and industry leaders to document the logistics of providing for disposal of debris delivered dockside by the fleet.

We look forward to continuing our partnership role with NMFS in this area and will welcome the opportunity to work with an intra-NOAA or inter-agency task force on this subject should one be formed.

Let me finish my testimony by addressing strategic research initiatives and international cooperation. The reauthorization bill before you suggests a process for periodically identifying a small number of strategic research initiatives that focus Sea Grant and university attention on important new marine issues.

This would be an important continuing process. Among the initiatives that we have suggested to be of strategic importance is the area of fisheries oceanography. Fisheries science and the oceanographic sciences have now matured to where there are important

opportunities to discover how oceanographic systems and events affect that part of the ecosystem which we harvest as fish.

What we have learned about frontal systems within the Great Lakes will help us be more efficient about looking at similar phenomena in the ocean. The strength in remote sensing technology at Texas A&M and at Rhode Island can be used to look at phenomena in the Bering Sea.

All of this ties in with important international work. Sea Grant provided the forum last year in Anchorage for scientists in the United States, Canada, the Soviet Union, Japan, and with observers from the People's Republic of China, to discuss the merits of an international scientific organization for study in the North Pacific and Bering Sea.

The recommended organization is often referred to as PICES. Networking on this international scale will enable us to address fisheries and marine science problems on an adequate scale and at an affordable cost.

All of the fish in the Bering Sea are not on our side. We are not the only nation to harvest those fish. If we are to effectively manage and exploit over the long term fish which either go beyond political boundaries or whose abundance is affected by regional scale events, we must broaden our understanding and we must broaden our data base.

Mr. Chairman, thanks to the support of this committee, we are a stronger program now than ever before. We have built the linkages within and beyond the Sea Grant network which give us optimism for the important advances that this university, government, and industry partnership will bring in the future.

Thank you, Mr. Chairman.

[The following information was subsequently received for the record:]

University of Alaska
Statewide System of Higher Education

OFFICE FOR FISHERIES

ALASKA SEA GRANT COLLEGE PROGRAM

May 29, 1987

Honorable Ernest F. Hollings, Chairman
U.S. Senate Committee on Commerce,
Science, and Transportation
Washington, D.C. 20510-6125

Dear Senator Hollings:

In response to your 20 May letter, I am pleased to have the opportunity to provide additional information relative to my 13 May testimony, particularly in response to Senator Stevens' question concerning marine plastic debris.

Recognizing the growing public awareness of the marine plastic debris problem, and also the interest of several Senators on your committee, the Sea Grant Association recently polled its network to learn of the various Sea Grant activities underway around this nation. It is clear that there is broad Sea Grant interest and activity on this subject. A brief paper outlining our perspective on marine plastic debris is in preparation and will be drafted in about a week. We will forward it to you as a matter of information, or if you wish, to be included in the record. This paper will also serve as a focus of discussion for the Sea Grant directors when they next meet in July during Sea Grant Week in Washington, D.C. Also during Sea Grant Week, the Marine Advisory Program leaders will be meeting to continue their discussions on marine debris. Joining with the Marine Advisory group in their discussion will be the Center for Environmental Education (CEE) another group that has been working closely with National Marine Fisheries Service on marine debris.

The discussion paper on marine debris now in preparation will touch on the following points:

- The present leadership for this important subject is the National Marine Fisheries Service (NMFS) Marine Entanglement Program. Within limited resources they are doing an excellent job.

- The most urgent area for research is to further evaluate the impact of debris on mammal and bird populations. It is clear that marine plastic debris is having a negative effect on these populations, but further quantification would be helpful. Because of its blue water fleet of research vessels, and through its observer program, NMFS should maintain the leadership in this area. Modest budget increases for their resource assessment activities could yield considerable information.

590 University Avenue, Suite 102, Fairbanks, AK 99709-1046 (907) 474-7086

- The most effective way to solve the problem of marine plastic debris is to stop disposing of waste material into the ocean, whether that debris comes from the shipping industry, the fishing industry, or from inadequate shoreside waste treatment facilities. We have known for years that we should not use the ocean as a dump. Clear policy guidance and supportive education programs will have a major impact.

- We believe that further expansion of its education role is the most important thing for Sea Grant to do. Given the problems of enforcement at sea, we believe that education is the long term solution. Education with the domestic fishing industry will be relatively easy. Fishermen have a stake in the health of the ocean. Education with the international shipping industry will be much more difficult, although enforcement may be easier.

- As I mentioned in my original testimony, the Sea Grant College Program at Oregon State University has been working with the fishing industry and municipal leadership in Newport, Oregon in both a program of public education and also in a trial and documentation of the logistics of providing for disposal of debris delivered dockside. Bob Jacobson of the Oregon Marine Advisory Program presented the preliminary findings of that trial to a meeting of 40 west coast Marine Advisory Program agents last week. It is clear that the network of marine advisory programs will be focusing more of their energies into this important area. We will also be using our communications staffs to develop useful publications directed towards various audiences.

  The findings of the preliminary program in Oregon combined with my experience as the Chief of Solid Waste Management in the State of Maine, cause me concern for how we may approach the policy solutions through MARPOL Annex V. Small transportation ports are in a highly competitive environment. These small ports and also fishing ports such as Dutch Harbor, Alaska, that provide services to a dispersed fishing fleet, may be the recipients of a problem they didn't create if they have to manage the disposal of debris collected at sea. Recent discussions by Louie Echols and Xan Augerot of the Washington Sea Grant Program with Jim Coe of the NMFS Entanglement Program further explored this shoreside disposal issue. Some careful and intensive technical and financial assistance may be necessary for these ports soon. Sea Grant will work on this problem, but I fear that our current human and financial resources could quickly be strained. Clearly this may be an area for priority effort. We will continue our cooperative efforts with NMFS.

- The merits of doing research on plastic materials themselves has been discussed by a number of us in the Sea Grant network. We do not believe that this would be a highly profitable area for marine academic research, or at least that the field is not "ripe" for major university activity at this time. Plastics are developed for highly specific purposes and therefore each plastic has unique properties. Industry chemistry staffs have the most specific knowledge of the materials which they have developed, and continue to refine. If dissolvable plastics are deemed desirable, the industry itself can most quickly develop the formulas. Because we have learned that burning plastics at inadequate temperatures causes toxic emissions, we may not want to dissolve plastic in the ocean environment. There may be a role for marine science in looking at the possible side effects of dissolving plastic in the ocean. Because of the specificity of plastic, and therefore of its by-products this would have to be pursued in cooperation with the plastics industry. Because of Sea Grant's experience in working in an academic/industrial cooperative role, there might be a valuable role for Sea Grant here if industry were to begin research in this area. We continue to believe that stopping the disposal of debris is the preferred solution.

  Should there be a marine biotechnology strategic research initiative, it is probable that some of the effort will be allocated to waste disposal opportunities. It does appear possible to engineer organisms that can help degrade otherwise non-degradable materials. It may well be that there is an approach to part of the plastics problem here. However, this is a long term effort, not an immediate application.

- The two biggest weakness that Sea Grant sees in the NOAA effort in marine plastic debris at the present time are: 1) lack of coordination, and 2) funding. We encourage the development of an intra-agency task force on marine plastic debris, and Sea Grant would look forward to participating on such a team effort. From that, an expanded productive role for Sea Grant might become evident. We believe that our educational efforts would certainly be enhanced by such a coordinated effort.

Senator Hollings, I hope that this information is helpful to your committee, and particularly to Senator Stevens whose question stimulated this discussion. Louie Echols of the Washington Sea Grant College Program, who is the current president of the Sea Grant Association, will forward to you within a couple of weeks our discussion paper on marine debris. If this letter and that paper leave you with further questions on this subject we will be pleased to respond.

Sincerely,

R K Dearborn

R.K. Dearborn
Director

Dr. Ross. Senator Kerry, my name is David Ross. I am Director of the Sea Grant program at the Woods Hole Oceanographic Institution. I am also Chairman of the Geology and Geophysics Department at that Institution. I am a member of the Ocean Studies Board of the National Academy of Science.

My written testimony focused on Sea Grant in Massachusetts and on the Hollings bill for reauthorization of the Sea Grant program. I attached to this written testimony some statements concerning Sea Grant work at the Massachusetts Institute of Technology and my own institution, which together cooperate with about twelve other institutions in Massachusetts on Sea Grant work.

These statements provide a small snapshot of a broad range of activities that we have in Massachusetts. They affect commercial fisheries, underwater technology, public health, new industries, beach nourishment, sewage treatment, and the like.

And they show, I think, how science can contribute to the solution of public concerns. The benefits from the studies at these institutions affect not just Massachusetts, but all states.

What I would like to do today is make just two or three other points. The first is that Sea Grant really is a unique approach to doing marine scientific research. Rather than dealing with individuals in a specific institution, as is generally done with other Federal organizations, Sea Grant deals with institutions themselves, and in that way they can bring together a broad breadth of interest and expertise.

The result can be a very coherent, multi-disciplinary program that can focus and attempt to solve some of our nation's problems. In my opinion, some of these national problems can actually be opportunities and can lend themselves very nicely to the strategic marine research program that we are discussing today.

My second point,—is to give you some examples of what we have been calling problems which I think with focused study can be opportunities. One that is common to the New England area, but also other parts of the United States, is the so-called red tide or paralytic shellfish poisoning problem.

It is slowly moving down the coast of New England. Its occurrance will make people in an area stop eating shellfish and the

effect will be catastrophic on an important local industry. That is the problem.

Now, there are solutions, one is that we are very close to being able to predict when red tides will actually occur. We will perhaps be able to make such predictions to within a week or two. If such a prediction can be made, a shellfish area can then be fully harvested before it even becomes infested.

Now, as I said we are close to doing this and we could thus turn this problem into an opportunity. It will involve chemists, biologists, fishery experts, shellfish wardens, the local community, everybody. But this is exactly the community that Sea Grant deals with and the way Sea Grant operates.

My second example concerns something that Senator Pell mentioned before, and that is the Law of the Sea treaty. We all know the United States has decided not to sign the treaty at this time. Nevertheless, the United States, along with many other countries of the world, has decided to claim essentially 32 percent of the ocean, the EEZ of the ocean, as part of their territory. This 32 percent of the ocean is greater than present land area. The extended jurisdiction has several problems and one certainly is for science. Within these areas, countries have established rules and regulations for the access of foreign scientists, and that is the problem.

A few months ago, we put together a chart which shows the different marine scientific research boundaries around the world. As you can see there are many regions where coastal states have established some type of rules or regulations concerning access for marine scientific research.

Now, I think this can also be an opportunity. What is happening now is the countries of the world are turning toward the ocean. They are anxious to explore and exploit it, to find out what they actually may have. Now, this presents a superb chance to market U.S. skills and expertise to these countries and build closer scientific ties, political ties, and economic ties with countries that are important to us.

The things that these foreign countries are looking for are very much what is done within the Sea Grant community—the care, preservation and use of the marine environment. The million dollars for international programs in the Hollings legislation will go a long ways toward helping this opportunity.

My third example is one that has been mentioned today several times, it concerns plastic in the ocean. This clearly is a problem, but we do not know the dimensions to the problem. We do not know how much plastic is in the ocean, where it is, and in many cases how big a problem it is.

Sea Grant could, because it has programs in 29 coastal states and it deals with over 300 institutions, make a tremendous impact here. I can visualize Sea Grant making a national coastal inventory, say within a designated week, to try and identify the scope of the problem. Within each state we could probably put several small boats in the field under a controlled situation or run a specific sampling pattern to assay what is actually out there as far as plastics in our local waters.

We could go even further. Through the national Sea Grant network, we could do much in educating the public as to the problem and any such possible solution.

Another example, of a problem that could be an opportunity, is the mineral dependence of the United States on sometimes undependable foreign countries. This dependence has also contributed to our trade deficit.

But many of the same minerals that we import, platinum, chromium, titanium, and manganese are present under our offshore waters. However, what we need is a national program to determine if we can exploit these deposits.

What we are doing now is just trying, in an almost random manner to find other areas where the minerals might be present. We have to know if and how we can exploit these minerals and if the environmental problems are solvable, and what technology is needed. These questions are the ones that have to be faced.

My last point is one that Senator Kerry has mentioned several times already today. We are entering a new period of understanding of the planet. Indeed, it is conceivable that an acceptable operating manual for the future use of the Earth may even result.

We are driven in this direction, unfortunately, by a series of potential worldwide problems. You have mentioned them: CO_2 increase, the potential world-wide temperature increase, the melting of glaciers and sea level rise, et cetera.

The oceans play a key in this, if not a critical role in these problems. A strategy for understanding the global ocean is being developed by various U.S. agencies. NOAA and Sea Grant are a necessary component to this effort. In particular, NOAA and Sea Grant have the expertise for the coastal component for this global ocean science effort.

This legislation that we are discussing today is a good positive step in this direction. We all know that Sea Grant has had some tough years, fighting budget and inflationary problems. But the Hollings bill for reauthorization, with the strategic initiatives, could be an opportunity for us to turn the corner.

And the timing could not come at any better time. Our understanding of the ocean is reaching a critical point and Sea Grant must play a role in future work.

Senator, I thank you for the opportunity to participate in this panel.

[The following information was subsequently received for the record:]

QUESTIONS OF SENATOR STEVENS AND THE ANSWERS OF DR. ROSS

Question. Do you meet with other Sea Grant directors to discuss "plans of attack" and ways to avoid duplication of efforts?

Answer. Yes. All Sea Grant directors meet three to four times a year at which time we usually discuss some of our major problems. Perhaps more important are the Northeast Sea Grant directors meetings at which we particularly discuss new research initiatives and other objectives. Finally, we also freely discuss plans via electronic mail and over the telephone.

Question. Could some of your "core program" be directed toward such problems?

Answer. Considerable progress could be made on the Marine Plastics issue if all Sea Grant programs were to dedicate some ship time and to assay their coastal regions as to marine plastics underwater. This could be coordinated into a unit sample pattern over a specific period of time. Cost would be the major consideration.

Question. How do you think the Massachusetts Sea Grant Program could most effectively contribute to the resolution of a nationwide problem like marine plastics?

Answer. We can make serious contributions here since we have ships that are constantly at sea and could develop a sampling pattern to define the principal accumulation areas. Several year ago we stopped using non-degradable plastic cups of which most end up in the water and do not degrade.

Question. Has the Woods Hole Sea Grant Program done any work on U.S.-Canada fisheries issues?

Answer. Yes. We have worked with some of the U.S. negotiators when they were defining U.S. policy for the Georges Bank boundary. More important, recently we supported the development of a book synthesizing the knowledge of Georges Bank.

Question. Does someone from the Massachusetts Sea Grant Program attend meetings of the New England Council?

Answer. Not on a present routine basis. A few years ago, Susan Peterson of our Marine Policy Program did attend these meetings.

Senator KERRY. Well, I thank all of you for those different perspectives, but nevertheless similar supportive comments about an important program. And I am sorry that my colleague Senator Pell had to leave, because as you all know and everyone knows, he is really one of the fathers of this program, and there is nobody who has been more responsive on these kinds of issues.

Let me just ask you a few questions, because I think your testimony, all of you, was extremely comprehensive and to the point and, frankly, answered some of the questions we might have had spontaneously.

But I might begin, Mr. Dearborn, with you, just to sort of move around here a little bit. But you talked about the networking, and I wonder if you would just say a few more words about that and tell us the importance of the Sea Grant network in all of its respects to a state like Alaska. What does it really mean to you?

Mr. DEARBORN. The state of Alaska is very large geographically, but small by population. We have a small university. We are very much a resource based state. Networking with the full range of academic institutions, particularly those that participate in Sea Grant, is a tremendous opportunity for us and one which we often take advantage of.

One of the opportunities at hand for the United States, much of that opportunity located in Alaska, is to move surimi technology from Japan to the United States. In doing that, we have our own Fisheries Industrial Technology Center in Alaska.

We are making real contributions, but one of the real equipment breakthroughs came from a North Carolina Sea Grant-supported effort in cooperation with Laval, and that technology is now being used in Kodiak, Alaska, and Dutch Harbor.

Those kinds of interplay within the network, those kinds of interconnections, are tremendously valuable to a resource—rich and people-poor state such as Alaska.

Senator KERRY. How much exchange would you say really takes place between the Sea Grant programs? Is it considerable?

Mr. DEARBORN. There is a tremendous amount. We beg, borrow, and steal from each other on many occasions. There is the official interaction, the periodic interaction of the directors as they get together. We do have the mechanism of the published Sea Grant abstracts, which we coordinate through the Pell Library.

There is excellent communication which certainly benefits all of us.

Senator KERRY. Is there any specific comments you might make as to the value that aquaculture research has to your state?

Mr. DEARBORN. Aquaculture is one of those areas where there are strengths around the nation, around the network of Sea Grant programs. I could share with you many stories which show the benefit of networking and the opportunities which have been captured in aquaculture.

A graduate student at the University of Maine who had done some work, genetic work, polyploid work with oysters, tied in with the faculty at the University of Washington and out of that came polyploid oysters. And these high tech oysters are a real boon to aquaculture all over the Northwest.

We can point to a number of circumstances in the soft shell crab industry. There are 13 cooperating institutions on the East Coast from 13 different states. That certainly produced a real move forward in that industry.

And yes, aquaculture is clearly an economic opportunity that we have captured in many places and one where the networking responsibility or the networking opportunities have really paid off for us.

Senator KERRY. And I know you mentioned in your testimony the value that the strategic research program would have to Alaska. Is there any way to make an assessment that that research could be accomplished under the existing core program or not?

Mr. DEARBORN. Because of the importance of the fishing industry to Alaska, our program in Alaska is fully focused on fisheries issues. To broaden those, to invest in an area of international cooperation, to invest in a new area such as fisheries oceanography, that would have to be done at the expense of our support to the fishing industry in other areas.

Senator KERRY. Senator Pell has returned. And Senator, as I said in your absence, I am sorry you were not here because I know the great role that you played with respect to this entire program. And I do not know whether you wanted to make any comment at this point in time or ask any questions.

Senator PELL. I did have a couple of small questions, if I could.

Senator KERRY. Absolutely.

Senator PELL. Thank you very much.

I am very interested and fascinated with your work that has been done on the Sea Grant program, and I would like to ask each of you to give us your stellar example of where you have found that a little money has produced a great success and what the return has been.

And I would start out with Dr. Ross and work down. Just one example.

Dr. Ross. I was afraid you were going to start with me.

The one that I think I am probably most pleased with is one that started out five or six years ago concerning red tides.

We had a young scientist at MIT who was finishing up his Ph.D. He came to our institution and started looking at the red tide problem. At that time, people talked a lot about the red tide, but did not know much about it.

He has shown first, that the problem is moving down the coast. Second, that the spores that cause the red tide unfortunately can

become resting spores. They can stay in the sediments for months to years before becoming active again. This is an unfortunate thing, but it is important to know.

The third thing he showed is that red tides often bloom in response to environmental stress and environmental problems.

Senator PELL. Excuse me. I was not really asking for your stellar example. I was asking for an example from a financial viewpoint. How much money did you spend on the program and what has that produced in private industry, and hence how it has helped the government.

Dr. ROSS. I am sorry. I made my comments too long.

What is being produced is a possible way to get around the red tide problem, to predict it, and then harvest the affected species before the red tide impacts the particular area. Probably the whole program has probably cost a quarter of a million dollars. If it is successful which it looks like it will be, it will be worth probably half a million dollars every year just to the town of Falmouth alone, and that is the little town I live in.

Senator PELL. It cost a quarter of a million dollars and it would be a half a million a year benefit?

Dr. ROSS. Just for my town. That is not the whole coast. If we could predict the red tides along the whole coast, we could forget about red tides.

Senator PELL. Thank you.

Mr. Dearborn.

Mr. DEARBORN. Senator, I will take an example from Maine because I have just now moved to Alaska and have only begun to make investments there. We will see later how well those investments pay off.

But in Maine, we invested about $26,000 per year for four years in a graduate student working with a poultry nutritionist. They developed a medicated feed for lobsters. You may see devastating losses of lobsters being held in captivity awaiting the market.

The benefits for that medicated feed, the lack of losses to red-tail or gafkemia, certainly are worth several million dollars per year.

Senator PELL. And the program cost?

Mr. DEARBORN. It cost approximately four years times $26,000.

Senator PELL. Thank you very much.

Dr. Bright?

Dr. BRIGHT. Maybe I will take a little different tack, because the Sea Grant program is not only research; it is advisory services and education. One example of a rather successful advisory enterprise in Texas recently was a series of workshops on marine corrosion, wherein our agents staged workshops for marine operators, for private boat owners, for fishing boat owners, conveying to them methodologies to protect their vessels and their wharves and their facilities from marine corrosion.

I do not remember all of the figures, but one particular marine operator estimated that it had saved him in the neighborhood of $200,000 over a period of a couple of years. These workshops are held on various subjects by our agents and our specialists.

The marine advisory program costs approximately a half a million dollars a year. It is difficult to relate the impact back to the individual time spent on that particular problem, but it is an ex-

ample of economic benefits from the advisory service that make it well worthwhile.

Senator PELL. Thank you very much.

Now, one final question or thought. And that is, as you know, the new around here is competitiveness, and each committee is making a contribution to the trade bill. There is going to be a trade bill. The question is what is in it.

And I was very glad that Dr. Ross mentioned the International Sea Grant Program and points out that we import over half the fish that we consume, at the same time we try to export fish.

And I am thinking of the squid which is off your coast and off Rhode Island, and I believe the Japanese have a 50 percent tariff on squid, which I raised with Mr. Nakasone when he was here. And perhaps we would be well advised to have sort of a Sea Grant or an oceans portion of the trade bill.

Every other committee is contributing something, and I do not know if this committee is or not.

Senator KERRY. Well, we are not yet, but that is a thought, Senator. And I think it is something that we ought to consider and think about.

Dr. ROSS. Important minerals are found on the sea floor, ranging from about $6 to $7 billion a year, and conceivably could be obtained from U.S. waters in future years.

Senator PELL. And if we really get the technology going and get a Law of the Sea in place, maybe we would be able to harvest it.

Dr. ROSS. We can do it within our own waters in some of these cases. We do not even have to go that far offshore.

Senator PELL. Do you mean the maganese nodules?

Dr. ROSS. I am thinking in terms of heavy mineral deposits and phosphorite deposits off Georgia, off Oregon, off Alaska.

Senator PELL. But the manganese nodules, et cetera, that is quite far out in the deep ocean.

Dr. ROSS. Yes.

Senator PELL. Thank you. And thank you very much indeed.

Senator KERRY. Thank you. I think that was one of the best questions of the day and helped to illustrate exactly what we are getting at here.

Just a couple of more questions, because I think we are really getting to the core here. But Dr. Bright. can you describe your involvement in the national shrimp genetics program?

Dr. BRIGHT. Texas has for a decade or more done a substantial amount of research on shrimp mariculture, and we have several shrimp farms operating in Texas now. There are also shrimp farms in Florida, South Carolina, Hawaii, Puerto Rico.

Senator KERRY. Why is that important, both in the context of the program and the purpose?

Dr. BRIGHT. Well, it is important because there are entrepreneurs in our coastal states who are interested in undertaking shrimp farming.

Senator KERRY. Why not simply leave it to the private sector?

Dr. BRIGHT. We are embarking now on a research program in Texas that concentrates primarily on shrimp genetics, shrimp endocrinology, trying to develop techniques for selective breeding,

and also bioengineering of shrimp. This is something the private sector cannot undertake.

It can only be done in the university setting, where the facilities are available and the scientific expertise is available. Private industry does not have the capability to undertake the basic research required to carry out shrimp bioengineering or shrimp selective breeding at the present time.

We have a project that we initiated only three months ago with Laguna Madre Shrimp Farms in south Texas, whereby two of our shrimp genetic researchers are participating with them in developing a shrimp selective breeding program.

This shrimp farm is in the fifth year of maintaining a captive stock and they are starting to see some rather odd genetic consequences, and so they have come to us for help and advice on what they should do to fix their captive breeding stock.

Senator KERRY. Would you also share with the Committee quickly the role Texas A&M has played with respect to the protection of turtles as an endangered species?

Dr. BRIGHT. We have a substantial program in marine turtle research and advisory services. The Kemps Ridley, which is an inhabitant of the Texas coast and Mexico, is the most endangered species.

There is a large controversy going on right now concerning the impacts of the shrimping industry on the populations of Kemps Ridleys. We are engaged in advisory activities to help inform shrimpers about the operation, installation and operation of turtle excluder devices.

We are also engaged in a small research project to assess the effectiveness of turtle excluder devices in retaining shrimp and excluding bycatch. In addition to these activities we have a substantial research program in turtle biology, endocrinology and reproductive biology particularly for the Kemps Ridley.

We cooperate with the National Marine Fishery Service in their head start program. So we are rather deeply involved in turtle research and turtle excluder device advisory activities.

Senator KERRY. Well, I think that is excellent work and obviously very important work, and I wish you well as it continues and hope that as your ability to be able to implement becomes defined out of that, that we will be able to do so and do so rapidly.

Senator KERRY. Dr. Ross, before we wrap up here I would just like to ask you a couple of questions also if I can.

Were the Massachusetts Sea Grant programs involved in providing information or involved in any way with the Georges Bank OCS lease sales?

Dr. Ross. We have done several things. One, we have had a modest research program there, and we have been supporting a very large compilation of all the data that is available from Georges Bank.

We have periodically made this available, a copy of this book will be out in a few weeks. Your office will be receiving one.

We have often worked with Congressman Studds' office, when he had questions on this. And we have done some detailed studies on, when the *Arco Merchant* for example went down, we were out there fairly quickly.

We have also looked at drilling mud problems, and in particular how they can effect breathing patterns of certain animals. And Georges Bank is of interest to us as an oceanographic activity.

Other parts of the institution, not just Sea Grant sponsored parts of the institution are interested in this and we have them looking in that area, and we have had a couple of workshops on Georges Bank.

Many years ago we had a workshop where we brought fishermen, drillers and scientists together to look at Georges Bank to see if there is a possibility that they can live together there. Some rather interesting things came out of that that are sort of lost but they are really quite important.

One of the biggest problems for fishermen is gear that is left behind or dropped on the bottom or kicked over the side. And we basically got an understanding that if something was to happen on Georges Bank that the drilling people would certainly worry about this concern.

The fishermen then also had some comments about well spacing and where they could work. So that was some nice efforts. The drilling on Georges Bank so far have not, as you know, has not produced much.

Senator KERRY. Did you make recommendations with respect to the early sales lease?

Dr. Ross. We commented on sites that we thought were poor because of drilling mud problems. We talked about circulation there and what could be done, and tried to make recommendations. Which sites were especially poor or——

Senator KERRY. What are your thoughts now on the reopening proposal?

Dr. Ross. I look at Georges Bank several different ways. It is an extremely unique environment.

I get a little concerned in an unconventional way. I get the feeling that if drilling is going to occur, it is going to occur, and I hope we do not use all our environmental enthusiasm against drilling and not what I think is an even more dangerous problem, and that is the movement of oil if we ever find it.

So I tend to think drilling by U.S. companies, with the proper safeguards and picking the areas carefully can be relatively, I say relatively, safe. But I think the moving of oil, if we even find oil or gas out there, gas is less dangerous, if we ever find oil, that is the one that really concerns me, is the movement of oil.

If you look around the world that is where basically much of the pollution occurs. Drilling, especially with high technology of U.S. companies is a relatively safe, relatively safe operation compared to shipping.

There are certain areas in Georges Bank that it would be a shame to drill. There are certain techniques you could use for drilling, such as drilling in deeper water and slanting in, that might be successful. Certain areas like canyons you should stay away from.

There are also certain seasons when drilling probably should not be done, and other seasons when it is safer to do it, depending on the breeding stock. So what I would hope of course is that we do not have to drill at all on Georges Bank.

If we do, we should try and be as innovative and careful as we do that. But worry about the total scope of the pollution problems. The chronic spills on a ship just from the activities of human beings and the muds are one. The catastrophes are another.

I must emphasize I worry most about the shipping than anything else.

Senator KERRY. When you say your first hope would be that we would not drill there at all, you say that because——

Dr. Ross. Well, I wish I did not have to. It is not the greatest of fishing areas. It is sometimes overstressed.

What it is is the greatest of fishing areas per unit area. There are so many fish caught there per unit area.

I am a marine geologist and I believe the possibility of finding oil, and more likely gas, out there is extremely high. I am almost a fatalist in this that I suspect it will eventually happen.

What I am concerned about is that we do not use all our energies in one aspect of the problem and not focus on what could be the most dangerous part of the drilling.

Senator KERRY. The assessments that I have read are three days of oil for this country's needs.

Dr. Ross. That is a tricky argument, Senator. I have heard that. I have heard 15 days also.

Let me give you the other side of the coin, but do not misunderstand where I am coming from. I am concerned about it, but let me give the other side of the coin.

If you had, say, 10 days of U.S. oil supply in Georges Bank, that is close to 30 years fish catch from Georges Bank. So those numbers, I think you have to be a little careful of how you do that.

We get about $1 billion a year fish catch from Georges Bank. We use 18 million barrels of oil a day in this country.

Senator KERRY. Well, I am not looking at it from, I am not sure that the economic measurement is the measurement at all.

Dr. Ross. I agree.

Senator KERRY. Partly because of the price. Partly because of the amount. But I mean it is really a risk cost balance versus benefit, and three days versus the possible long term disaster, it is hard to see how the U.S. is, I mean the long term resolution of our energy problems does not lie in a three day spurt of everybody being able to get where they are going to go, measured against the risk of what goes with that.

Dr. Ross. Senator, I agree with you. Perhaps I did not phrase myself right. I want to make the point that sometimes that comparison of days of oil versus——

Senator KERRY. I am just trying to get a sense of what it is.

Dr. Ross. I think it is a very important, unique environment, and I personally as a geologist feel that it has oil and gas potential and if it ever is to be explored, I would prefer of course that it is not explored, but if it is to be explored——

Senator KERRY. I think you make a good point. Are you involved in the PCB research in Boston or New Bedford?

Dr. Ross. Yes. In New Bedford in particular. We actually blew the whistle on that problem down there and found the PCB concentrations in the Bedford harbor.

There are areas there that the copper concentration is so high that if a company could get a lease they could mine the copper in the bottom sediments. It is 1 percent copper. We mine .5 percent copper in other places.

Senator KERRY. What about the DDT problem in Boston harbor? Have you looked at that?

Dr. Ross. Not in that same detail. I think some of my colleagues at MIT have. Boston certainly has a problem. I am not sure how to solve it.

Senator KERRY. Could you classify the level, is there any health hazard threat in the problems that exist in Boston harbor?

Dr. Ross. Let me divert you just for a second to New Bedford harbor, which I know for sure. There are areas that are closed in New Bedford harbor that I would think a person would be very foolish to eat a lobster or some bottom fish from New Bedford harbor, regardless of what the Federal regulations are.

As far as Boston, it is hard for me to say. I have probably seen the same pictures you have of some of these fish coming up with tumors on them. Certainly very unattractive looking creatures.

I like to fish. If I was catching one of those fellows I do not even think I would want it on my boat. No, I do not think I would want to eat it. But I do not know enough to tell you if it is dangerous to your health. But it is certainly not very attractive to the mind to see these creatures.

Senator KERRY. Let me ask you sort of a variation on Senator Pell's question as a closing question.

You mentioned the one economic impact and picked the favorite. Let me ask you if it is possible to summarize a sort of total consequences of the research undertaken under the Sea Grant program at Wood's Hole economically to the state and to the communities affected.

Dr. Ross. Well, in a way it is awesome in Wood's Hole. Let me tell you why.

Our operating budget is $50 million a year. Sea Grant is $700,000. That is less than 2 percent of our operating budget. But many of our Sea Grant projects are tied to larger NSF projects. What we do is look at the applied aspects of some of our more basic research. That is one thing.

Some of the specific things we have done, I am always a little hesitant to put numbers on these things and what they are worth. But when the biggest industries on Cape Cod, as you well know, is tourism and the healthy shellfish industry and the fishing industry is key to this.

We are trying to bring the resources of my institution and other institutions to bear on this problem. And I think we have made an impact. And how you translate it into dollars is hard to do.

But I think the Sea Grant program is certainly a plus for the U.S. in an economic sense. And we have not mentioned today it is a matching program.

The Commonwealth of Massachusetts, which is a unique commonwealth, unique state as you know, in their wisdom they do no not contribute any support to the two Sea Grant programs in Massachusetts, although the states do.

So in Massachusetts for the $700,000 that Wood's Hole gets, we actually provide $350,000 in private funds to match that program. And MIT does basically the same thing.

Senator KERRY. Well, gentlemen, I want to thank you on behalf of Senator Hollings and the entire committee. I think this has been an important session.

As you know we met to consider the reauthorization as to the ocean and coastal programs, which we have talked a lot about. But also general program support, and I think your comments, certainly on Sea Grant and the prior comments have made it clear that there is a great deal of support here in the Congress and on this committee for level funding and where possible for additional.

I think you are going to see a considerably different budget response from the Committee. But I want to thank you for helping us to understand the success of these programs and the importance of them, and wish you well in your continued efforts.

We look forward to working with you. I thank you very much for taking the time to be here. The record will remain open for a week for the submission of additional information, if there is any and for the return on written questions.

Without further comment then this hearing is adjourned.

[Whereupon, at 4:25 p.m. the hearing was adjourned.]

ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

STATEMENT OF HON. ROTH, U.S. SENATOR FROM DELAWARE

Mr. Chairman, I am pleased to be here today and to join my colleagues in support of legislation that would reauthorize the Sea Grant Program through FY 1992. In my opinion it is very important that we reauthorize this productive, and effective program. Reauthorization of the Sea Grant Program would continue activities that address national priorities for marine resources and the marine environment.

I have always been a strong supporter of the Sea Grant Program. It has managed to effectively combine research, education, technology transfer, and public service into a program which enhances and promotes the wise use of our Nation's estuaries and coastal regions. It is a good example of educational institutions, Government and the private sector working together to address coastal and marine issues for the public good. This merit-based, tightly managed and highly successful national partnership has been attacking problems at the grassroots level long before they are perceived in Washington. It is well worth the investment of Federal dollars.

The University of Delaware was designated as a Sea Grant College Program in 1976. I am proud of Delaware's program and accomplishments. It's current emphasis in marine biotechnology, estuarine and coastal environmental assessments, geological and coastal dynamics, and marine program outreach have made major contributions to fuller utilization and greater efficiency in marine and coastal resource based industries.

In order to understand how and why Sea Grant works and why it is more important to the Nation than ever, we need to understand the economic development of the marine and coastal resources of the United States, which have attracted much attention in recently. The national income accounting system, a technique that indicates the economic contribution of various economic sectors, places the ocean economic sector value at $30.6 billion dollars in 1972 dollars. This compares with agriculture at $35.6 billion, mining at $18.9 billion, construction at $58 billion, transportation at $46.2 billion and communications at $29.4 billion dollars. It is thus doubly important that we develop wisely this Nation's economic opportunities in the marine and coastal environment. I would like to mention some of the more recent accomplishments of Delaware's Sea Grant Program in this arena.

Fouling—the encrusting of barnacles and other foreign matter on marine vessels and other objects—is an ever present problem. In the marine environment, biofouling is a significant problem and has major cost problems. In the U.S. alone, the annual cost of reducing marine biofouling is more than $1 billion. Laboratory experiments have resulted in localizing and identifying naturally occurring antifouling components in such marine organisms as corals and sponges. By understanding how natural chemical defenses that deter fouling operate University of Delaware scientists hope to gain insight into new and better methods of preventing biofouling on marine vessels and other artifical substrates.

Delaware scientists have developed methods to extract chitin, a cellulose like structure found in the shell of crabs, shrimps, and other marine animals. Chitin is considered a waste produced by seafood processors. However, chitin has many applications including uses for nontoxic filters in cleaning up waste water, nutritious additives in animal feed, water binding, fat binding, and emulsifying agents in the food processing industry, and as a soluble medical suture and wound-healing agent in medicine. Scientists are also developing novel chitin products that could be used in the cosmetics and pharmaceuticals industry.

Sea Grant is also important for continued study of the Delaware estuary, a major source of commercial and recreational growth for the mid-Atlantic region. Decisions on future development on and around Delaware Bay are based partially on Sea Grant studies.

Sea Grant's marine advisory service activities encompass a wide range of projects designed to educate and enhance the lives of those who enjoy Delaware's beaches. The marine reports advise boaters and provide updated weather reports. The seafood retailers and the charter/headboat industry have found the business workshops

projects to be of great value. You may be interested to know that economists who have recently made a determination of the economic benefit of the Delaware estuary to Delaware. The economists determined that for every 100 jobs that are directly related to the estuary, another 120 jobs in Delaware will be created. For every $100 of wages from these jobs an additional $80 of wages is created and for every $100 in sales associated with these jobs $20 additional sales is generated. By way of contrast previous studies have shown that the employment and wage mutipliers for Delaware's automobile manufacturing industry are only 80 percent of the estuarine mutipliers and those for Delaware's banking sector are just 60 percent.

Finally, Mr. Chairman, since its designation as a Sea Grant College Program in 1976, the University of Delaware has had, and continues to have a strong commitment to the education of students pursuing marine studies. Often these students are assigned to research projects supported by the program. This arrangement provides the graduate student with an opportunity to acquire training in research techniques and problem solving that is transferable to their future careers. As a matter of fact many of these students have gone on to successful marine related careers in industry, State and Federal Government, and academia.

I urge a favorable consideration by the committee on this legislation, and look I forward to address this issue with my colleagues.

STATEMENT OF DR. B.J. COPELAND, NORTH CAROLINA STATE UNIVERSITY

Thank you. I am B. J. Copeland, Director of the University of North Carolina Sea Grant College and Chairman of the NASULGC Marine Division Federal Relations Committee.

I appreciate the opportunity to present testimony on the role of research in addressing the challenge of better use of this nation's coastal area. I am presenting this on behalf of the Marine Division of the National Association of State Universities and Land-Grant Colleges (NASULGC) and the Sea Grant Association (SGA). The Marine Division of NASULGC, is composed of 90 major marine research and education institutions in the United States which are committed to the understanding, conservation and development of the ocean and coastal resources. The Sea Grant Association consists of 40 colleges, universities, research centers, industries and consortia, all dedicated to enhancing the nation's capability to develop, use and manage our marine resources. NASULGC is composed of 149 colleges and universities with a total enrollment of about 3 million students and who grant a majority of the graduate degrees granted in the country.

BACKGROUND

I presented testimony to this Committee two months ago to bring the issue of the importance of the coastal before you and to remind you of the need to undergird our management of those crucial resources with an effective, fundamental research program. Today, I am presenting an idea for a research initiative designed to provide the most critical new information needs.

Two months ago I reminded you of some important facts about the estuaries and our nation's coastal ocean:

The extensive estuaries bordering the ocean and Great Lakes shores of our nation are valuable resources and are critical areas for economic development.

Nearly 75% of our people live and work within 50 miles of the ocean and Great Lakes.

Management of these complex and variable segments of the coastal ocean is a formidable job, but remains impeded by our level of ignorance about their fundamental processes.

We are faced with the problem of large amounts of money being spent on estuarine programs with little of it dedicated to competitive, long term, research that could lead to major breakthroughs in our understanding of estuarine processes.

The Sea Grant College Program, serving as a network of 300 colleges and universities throughout the nation, has built an effective network that is uniquely positioned to effectively assist the vital partnership between the federal and state agencies by providing the generation of new, relevant information fundamental to a more effective management program.

STRATEGIC RESEARCH PROGRAM

We are proposing a process-oriented investigation of estuarine productivity that will offer an alternative to previous studies that have attempted comprehensive examinations of single estuaries or investigations that have focused on specific wastes

or pollutants. Instead, we propose to focus on a process-oriented approach that is more tightly-targeted and will make estuarine studies more tractable, while allowing studies to be undertaken simultaneously in a variety of estuaries. We have scoped out the strategic research plan through the involvement of a cadre of leading estuarine scientists from leading universities and NOAA laboratories.

Comparative studies of estuarine productivity, in similar estuarine habitats, over space and time, lie at the heart of the proposed initiative:

The approach lends itself to the formation of multi-disciplinary, inter-institutional teams, which is suited to NOAA/Sea Grant with its national network of scientists, academic institutions and research facilities.

Estuarine mesocosm facilities, available through a Sea Grant College, is of special assistance in coalescing and interpreting results obtained through specific experiments.

Fundamental and comparative studies of estuaries are not easily accommodated in the programs of federal and state agencies with major regulatory responsibilities since they usually have site- or drainage basin-specific orientations.

Comparative studies by NOAA of estuarine productivity should yield fundamental information that will complement, rather than duplicate, the missions of other agencies.

Comparative proposals from estuarine scientists will serve as the creative basis for the approach.

You have included the framework for this important initiative in the Strategic Research Program in the new Senate Bill—re-authorizing the National Sea Grant Program. You are to be commended for your innovativeness in proposing the Strategic Research Program because it will provide a mechanism to use the capabilities already demonstrated to focus on the coastal ocean a research program of major impact. This will, of course, require targeted funding to enable credible effort.

The proposed initiative will focus upon the hypothesis:

Changes in estuarine productivity are functions of human induced and natural alterations upon habitat structure and food web dynamics.

This hypothesis can be tested in highly selected estuarine habitats and experimentally-controlled mesocosms. Parameters considered to be of highest priority are freshwater input, nutrient loading, trophic dynamics, habitat structure and function, and toxicant loading.

WHY SEA GRANT, WHY NOW?

Recent legislation, such as the Clean Water Act and its amendments, has placed estuaries in the limelight. Legislators, environmental managers, the media and the general public have been made increasingly aware of the existence of estuarine ecosystems, their importance to coastal environments and the potential harm that may come to these systems as a result of short-sighted or inadequate management. This heightened awareness coincides with the maturation of many subdisciplines within environmental sciences, which Sea Grant has developed. Computer technology and enhanced and the development of multi-disciplinary efforts modeling capabilities for the first time have placed within reach the ability to describe estuarine dynamics with some realism. New instruments, and facilities, and a better understanding of the timeframes of estuarine processes, have opened the door for a quantum leap for estuarine science. The infusion of additional estuarine research funds to NOAA/Sea Grant, its researchers, will permit maximum exploitation of these circumstances.

A core estuarine program is in place that is positioned to undertake a focused, comprehensive study of estuaries. These strengths should be immediately utilized because:

The U.S. has a serious concern over its competitive relationship with other countries, especially on the deficit of trade. Research can improve our ability to manage estuaries to improve our economic return.

Our scientists are at the cutting edge of scientific sophistication and have a firm grasp of modern technology that can be applied to a better understanding of estuarine processes. Failure to exploit this now could lose this opportunity to other interests and demands.

The highest levels of technical sophistication are now available to coastal and estuarine applications. This technology and capability can now be used to enhance scientific inquiry at levels used in deep ocean work.

From a political view, the continuation of expending funds on local sites for standard management without providing better fundamental scientific understanding to undergird the management is rapidly becoming viewed as unacceptable. Fundamental science is needed to improve management success.

We are poised to initiate a series of high-priority, multi-disciplinary and multi-institutional research programs to address critical estuarine issues.

CONCLUSION

We stand ready, Mr. Chairman, to bring the ample capabilities of our universities, a valuable national resource, to assist you in your vital attempt to improve the nation's ability to more optimally utilize our valuable resources. We believe that the potential value can be enhanced by applying new knowledge in more innovative ways to improve our management strategy. Creative research, the kind that has become the trademark of our Sea Grant Colleges, is the key to realizing this goal. Your innovative proposal for a Strategic Research Program provides the mechanisms. We would be pleased to respond to your invitation for more specific implementation approaches.

Thank you for your support of the Sea Grant College Program and for the opportunity to offer our ideas.

United States Senate
WASHINGTON, D.C. 20510

April 2, 1987

The Honorable Ronald Reagan
President of the United States
The White House
Washington, D.C. 20500

Dear Mr. President:

We are writing to request your assistance in developing a coordinated strategy to resolve the increasingly serious and complex problems resulting from the presence of plastic debris in the marine environment.

Plastic debris is accumulating in the oceans and coastal waters of the United States and other nations at an alarming rate and in a wide variety of forms that reflects the extensive use of plastics throughout the world. Everything from small plastic pellets used in packaging, to monofilament fishing lines and net fragments, to packing bands, bottles, six-pack connectors, bags, and large sheets of plastic are found floating in the water and littering our beaches. This plastic debris does not degrade readily and persists for many years with potentially devastating impacts on the living marine resources and our commerce, safety, and enjoyment of the marine environment.

It is estimated that 50,000 northern fur seals die each year after becoming entangled in discarded plastic packing bands, causing the population to decline by 8 percent per year. Endangered and threatened sea turtles, pelicans, and sea birds become entangled and die in plastic debris and ingest the debris with other food or mistake it for jellyfish or other prey items with a fatal result. Human safety is also jeopardized by plastic debris. Vessels have been disabled when their propellors and other gear are fouled with plastic ropes, netting, bags, sheets, and fishing line, and divers as well as research and military submarines have become entangled in lost and abandoned gill nets. Finally, our nearshore waters and beaches are despoiled by plastic debris with adverse impacts on aesthetics and the tourist industry upon which so many of our coastal communities depend.

The list of the sources of marine plastic debris is nearly as disturbingly long as is the inventory of the types and quantities of debris. Merchant and military ships, commercial and sport fishing vessels, recreational boats, sewage treatment and storm water facilities, and a host of other shoreline activities all contribute to the problem through discard, discharge, loss, or abandonment of plastic materials. Similarly, those diverse activities are subject to a variety of federal research, educational, and regulatory programs under a number of statutes within the jurisdiction of the Departments of Commerce, Defense, Interior, and Transportation, the Environmental Protection Agency, the Department of State as they relate to international affairs, and other federal agencies. Not surprisingly, the result has been a fragmented approach to the problem.

We believe there is a pressing need to focus and coordinate the various efforts of the federal government to develop solutions to the marine plastic debris problem. For this purpose, we respectfully suggest that you establish a high level, interagency task force to conduct an expedited assessment of the problem and potential solutions. Ideally, the task force would be able to generate within the next several months a report setting forth an action plan of measures to reduce or eliminate marine plastic debris and its adverse effects, as well as such research and development efforts and additional legislation as are warranted. The action plan should provide for evaluation of the feasibility of utilizing degradable or other materials to accelerate decomposition, instituting bounties and other incentives for retention and retrieval of debris, increasing public education campaigns, and other measures. It should also identify existing mechanisms, such as the coastal zone management and sea grant programs that could provide a national network for a concerted attack on the problem. Such an assessment would complement current programs and would be of substantial assistance to us as we seek to formulate a comprehensive solution.

Marine plastic debris offers a challenging opportunity to mobilize the resources, talents, and best efforts of the federal government in developing a coordinated strategy to resolve the problem. We look forward to working with the members of your task force in developing and implementing that strategy.

With best wishes,

Sincerely yours,

ERNEST F. HOLLINGS

TED STEVENS

BOB PACKWOOD

JOHN C. DANFORTH

LLOYD BENTSEN

JOHN F. KERRY

PETE WILSON

JOHN McCAIN

WILLIAM S. COHEN

DANIEL K. INOUYE

PAUL S. TRIBLE, JR.

DONALD W. RIEGLE, JR.

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FRANK H. MURKOWSKI

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BARBARA A. MIKULSKI

NANCY LANDON KASSEBAUM

LAWTON CHILES

JOHN C. STENNIS

HOWELL T. HEFLIN

DANIEL J. EVANS

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